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Fruits of Experience

WHILE the working out of the technical details of engineering schemes is usually done by younger members of the profession—those closer in time to their academic studies and in more direct association with their day-to-day mechanical application—there still remains the need for ability to co-ordinate the various factors and to decide on the relative merits of schemes. This calls for ripe experience of a kind that over the years has come to have almost the quality of an acquired instinct. It is in this way that presidential addresses can generally give a lead.

Statistics may be made to prove anything, the cynic has said. They become of real value, however, when used by men with a real knowledge of their subject, not to prove a case, but rather to support and illustrate their views in communicating the results of their experience to others. In other words, it is not so much the figures that count as the men behind them. Often, too, presented in such a manner they start a train of thought that suggests future lines of advance.

In this light we may regard the presidential address to the Institution of Civil Engineers delivered by Mr. S. B. Donkin, who is the first electrical man for many years to hold the highest office in the oldest engineering technical society.

Naturally, he dealt mainly with electricity supply matters, and one thought suggested by his survey of the position is how very much less involved would be the problems of distribution if its chief features lent themselves as well to exact estimation, comparatively speaking, as do those of generation and main transmission. Mr. Donkin's figures and graphs relating to generation were based upon what has been, and can be again, achieved, and the imponderables are open far less to disputable deductions.

Qualifying conditions there are, of course. Thus, in regard to water-power, the most readily accessible and less costly projects tend to be exploited first, so that a higher expenditure per kW may be anticipated for future schemes in contrast to schemes employing steam and oil engines.

The particulars given regarding oil engines are disappointing, but they do indicate what improvements should be aimed for. As things are, high capital cost per kW and relatively low output capacity for the space occupied (the Copenhagen 12,500-kW set is, we believe, the largest running in public supply) offset their merits, including that of quick starting.

In prophesying that at least 30,000 million kWh will be sold in 1950, Mr. Donkin does not appear unduly optimistic. The Weir Report estimate of 21,000 million kWh in 1940 bids fair to be easily exceeded at the present rate of progress, and 30,000 million kW would be attained ten years later by an annual increase at an even annual rate (not compounded) that is equivalent to less than half the present numerical advance.

The real difficulty comes in attempting to decide the best means of dealing with distribution, from the data available, to effect improvement. How far is an extension of rural distribution really responsible for the decrease in kWh sold per £10 of distribution capital? How far is the decline due to the connecting up of consumers who require educating in the benefits obtainable from a greater use of electricity? What is the unit load density or size of area that gives the best all-round results? How much value should be attached to diversity in practice? How much to local initiative?

In such matters there is not nearly enough co-ordinated information upon which to dogmatise, and any scheme of reorganisation to be brought before Parliament should be as flexible as possible in order that full use may be made of the invaluable experience of those who have been in close touch with distribution problems all their lives but are yet able to appreciate the need to move with the times.

Modern Methods

SOME sound sense regarding the correct use of electric heating and lighting was imparted by Mr. Anthony Bertram in a radio talk last Monday. He scouted the idea that electric fires gave a dry stuffy heat, pointing out that this was merely due to disregard of ventilation. The adaptability of the electric fire was not taken advantage of—people still insisted on putting it in the fireplace and crowding together on that side of the room. In fact, electric fires were tricked out to resemble coal fires when they were different things altogether. New methods were adopted much more readily in the kitchen—he had never seen an electric cooker masquerading as an old-world coal range. Mr. Bertram also protested against the misuse of electric light; in particular, the flex-suspended central fitting. He agreed to a central diffused light, but insisted that this should be generously supplemented by local lighting points. He also raised the old problem of the light over the bed. In fact, Mr. Bertram said what we electrical people have been saying for many years, and he had the good fortune to reach a wider audience. He deserves our thanks for an excellent electrical educational effort which should do some good.

Starting Right

FIRST impressions are important, and the triteness of the phrase must not be allowed to obscure its truth. A prospective consumer who is subjected to irritating delays is likely to fall straight into the arms of the gas company. Therefore, for new houses everything should be planned in advance in conjunction with the builder so that the tenant upon his arrival finds everything electrical ready for use. This means a good deal of trouble for the supply authority, but it also means business now and more business in the future. For this reason we commend to the attention of electricity supply sales staffs the article on "Co-ordination and Load Development" on page 628, which contains some useful advice formulated from experience. The author, who has been senior inspector to a large undertaking for some years, explains, among other things, why cookers should not be installed on Monday, Friday, or Saturday—an apparently unimportant matter but actually a "tremendous trifle."

Mr. Woodhouse's Views

THE benefits of large-scale electricity supply under uniform conditions were emphasised by Mr. W. B. Woodhouse, of the Yorkshire Electric Power Co., last week when he addressed a municipal association. He said that he realised the pride which local authorities took in a successful municipal undertaking, but suggested that so long as the end was attained (*i.e.*, a cheap and abundant supply of electricity) the means were not important. In his opinion a local authority, freed from the responsibility of running its own undertaking, was in a better position to secure what it wanted. He saw no difficulty in ensuring that areas already enjoying cheap electricity should not be deprived of that advantage, and that they should share in any future benefits. He maintained that the McGowan Committee had reached correct conclusions, but he deprecated the tendency to centralise control in "an ever-growing bureaucracy in London."

London Transport

IN spite of the long stoppage of the London buses in May last, the London Passenger Transport Board's traffic receipts were higher, thanks to its share of the main-line railway pool, which was augmented by the Coronation traffic. Probably the most interesting feature of the report, electrically speaking, was the further advance of the trolley-buses. Their number was more than doubled during the year, rising by 350 to 594, while passenger journeys were trebled. Since the close of the year (June last), many more of these vehicles have been put into service. The trolley-bus is said to be very popular, and the supersession of the trams is proving economic. The amount of electricity employed increased by about 3.7 per cent., and £377,700 was expended on power supply during the year. To improve the working of this department there has been a rearrangement of duties, and three distinct sections have been established to deal with generation, distribution, and new works. The study of industrial and residential developments in the Board's area included in the report makes it a social document of considerable importance.

Compensation

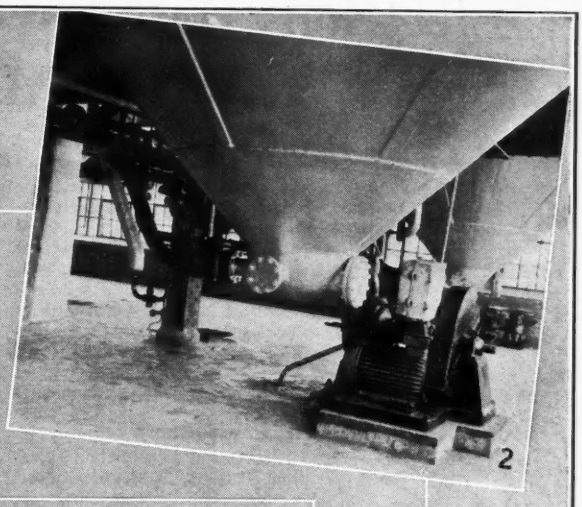
IN almost every scheme of reorganisation some individuals in the concerns involved find that their services are no longer required, or that they are to suffer loss of status and remuneration. To meet this contingency in any scheme of electricity supply reorganisation the 1919 Act contained a section providing for the payment of compensation to "officers or servants" of supply undertakings adversely affected by such a scheme. The principle received continued recognition in the subsequent Acts of 1922, 1926, 1928 and 1933, and the Electrical Power Engineers' Association has taken steps to ensure that the new Distribution Bill shall include clauses providing for compensation to displaced employés or to those whose positions are worsened as a result of the Act. The new clauses have been fully discussed with the Electricity Commissioners and have passed to the drafting officers for their attention. The E.P.E.A. official journal says that one point of great importance which had been brought to the Commissioners' notice was the desirability of making the proposed new clauses applicable to previous Electricity Supply Acts.

North Wales Proposals

A SCHEME for the formation of a Joint Electricity Authority for North Wales and South Cheshire has been adopted by the Local Authority Electrical Undertakings Association of that area, "on the assumption that the Government require large-scale electricity amalgamation in implementing the McGowan Report." The authors of the proposal estimate that the cost of acquiring the undertakings in the area would be £6,000,000, but assuming that the outstanding loans of the present authorities were taken over only £2,500,000 of new money would be required. An amendment proposing that consideration of the report should be postponed until after a meeting of the Small Undertakings' Association on November 12th was rejected, on the grounds that the matter was urgent in view of the imminence of the proposed Bill.

Public Lighting Standards

THE Final Report of the Departmental Committee on Street Lighting, the leading particulars of which are given in this issue, is mainly concerned with technical matters. A perhaps unexpected recommendation is that roads should be divided into two classes only, with an appreciable gap between them with regard to illumination. Due regard is paid to the need for economy, but it is to be hoped that the true meaning of the word "economy" will be made plain to lighting authorities. The recommendations do not, of course, constitute a specification, and no doubt the British Standards Institution will in the near future produce a more precise document that will yet be flexible enough to allow for possible developments. With regard to the latter, 400-W "luminescent" lamps are expected to be available shortly for use where a nearer approach to normal light than that given by the ordinary mercury-vapour lamp is required. Luminiscent lamps are said to emit 6 per cent. red rays, more than three times the proportion given by the usual type of discharge lamp and about half that of north daylight. Inspection of advance models appears to indicate that this is quite enough for most purposes. Actually it is near to daylight tan the tungsten gas-filled lamp, which emits no less than 27 per cent. red light.

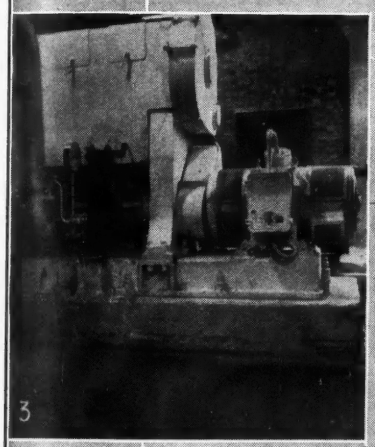


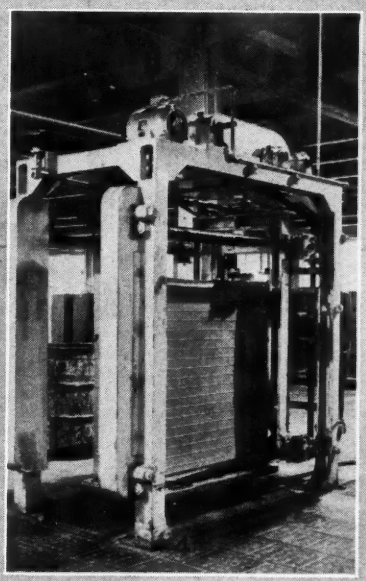
Processes in a Soap Factory

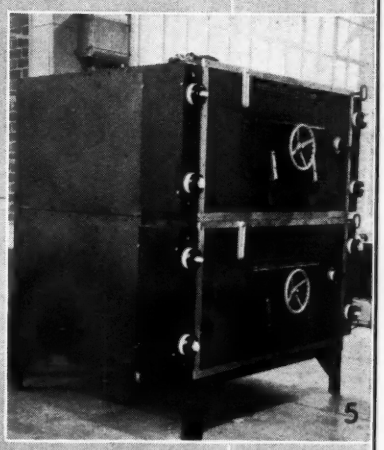
1. End-on view of flake mills showing ceiling-suspended motors and starting equipment.
2. A lye-pumping set under a "kettle."
3. Motor-driven h.p. pumps for soap spraying into powdering "tower."
4. A soap-slabbing machine.
5. Experimental 10-kW "Magnet" baking oven installed in cooking-fats department.
6. Agitator drive for a refining "kettle."
7. Line of boiling "kettles" showing inspection and level-indicating lights.

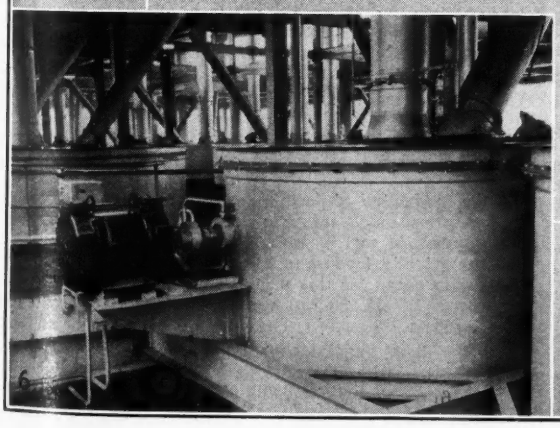
Elec. Rev. photos.

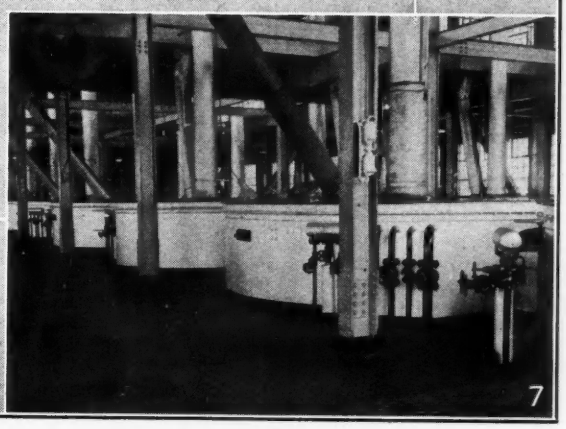
(See next page)











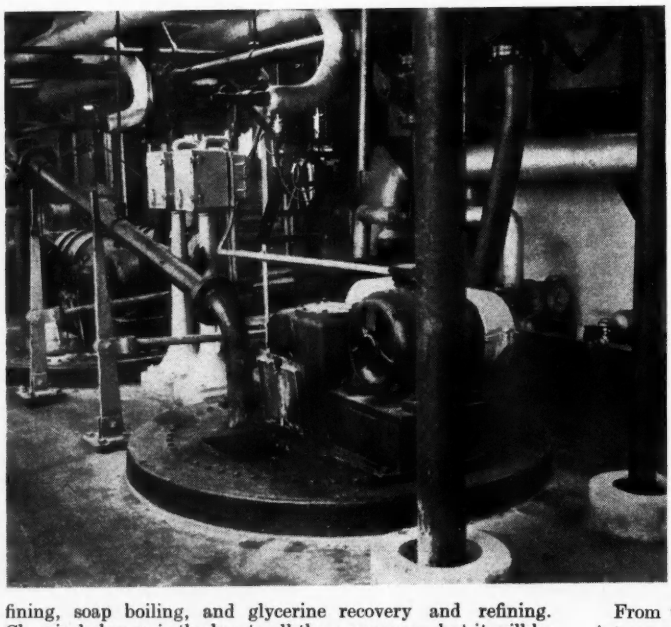
Electricity in Soap Making

An up-to-date Manchester factory

A high load factor is maintained and, by the use of special motors, local p.f. correction to 0.95 per cent. is secured

EFFICIENT operation by means of numerous short enclosed "Texrope" drives from comparatively small motors is one of the controlling principles of the electrical installation at the large new factory at Trafford Park of Thomas Hedley & Co., Ltd., which we recently visited. Others are the maintenance of a high load factor by scheduling various operations for different times of the day; local p.f. correction to 0.95 per cent. by the use of motors specially designed for that purpose, with no correction at the source of supply; and careful balancing of the process steam with electrical driving to achieve the greatest possible overall works efficiency.

The works may be considered as in two main sections, one devoted to the production from fats and oils of liquid soap and the other to the preparation and packing of the different classes of products. On the manufacturing side there are four main processes—steaming and storage, bleaching and refining, soap boiling, and glycerine recovery and refining. Chemical change is the key to all these processes, but it will be seen that in practically every case this is dependent on the large-scale use of electricity. Fats, oils and caustics are received by road, rail and canal, and after being melted down by steam heating the liquids they are pumped *via* settling tanks to huge storage cylinders outside the building. We saw compact directly-coupled Mather & Platt motor-pump sets engaged on delivery from the settlers to storage.



A pair of crutch-pan stirrer drives

As required, the raw fats are then pumped into refining tanks where chemical change is dependent upon rotary agitation during heating. A typical example of an agitator drive is a small motor arranged horizontally a few feet from the refining "kettle," near the top, with its shaft extending through the cylinder wall and coupled inside the tank to the central paddle shaft by bevel gears. A tiny belt drive from the main shaft serves a forced lubrication system for the bearings in and about the heated tanks. The motor is of the closed ventilated type with push-button-contactor control.

Soap Boiling

Conversion of the refined fats into soap is effected by boiling with caustic soda in large vertical cylindrical kettles which extend through two floors of the building. The caustic is added in several stages for each of which a separate boiling is required, and during boiling lyes, or liquids containing glycerine, salt and water are released. Electrically, the feature of these multiple processes is the extensive pumping requirements. First, there is the pumping of the fats into the kettles. Then, in its various stages of process, the liquid soap is pumped from kettle to kettle. At least one pumping of lyes is required for each boiling, and finally the finished soap is removed from the kettles to storage tanks. The soap is fairly viscous and is not always easy to pump, but beyond the increased power required, the measures to meet this difficulty relate to the mechanical design of the pumps. There is a battery of pumps under each pair of kettles, connected in a somewhat intricate system of piping to permit to and fro pumping. One example of these pump drives is a 15-h.p. Lancashire Dynamo enclosed motor, with an internal fan which circulates air finally over the ribbed exterior of the frame, serving a Viking pump and having Electrical Apparatus Co. push-button-contactor control.

During boiling the soap rises and falls in the kettles and various levels are indicated by coloured lamps a few feet above the covered tops of the kettles. Each lamp circuit includes the soap itself and an electrode which is immersed in the tank at the top to a given depth so that when the soap rises to touch the end of the electrode the required indication is given. At a suitable aperture in each kettle cover an angle lighting projector is arranged for convenient inspection of the interior through a window. Tough rubber sheathed "drops" serve these inspection lamps. To a much lesser degree the glycerine recovery plant also necessitates a good deal of pumping. There is first the pumping of the lyes and then of the glycerine in its various stages of refining, while salt recovery is effected by pressure pumping solutions through filters.

The Products

From the refined liquid soap tablets, powders and flakes are produced, and in each case the processing plant is arranged with the packing equipment for continuous-flow operation. For the production of tablets liquid soap is first poured from overhead tanks into spring-mounted weighing vessels or crutch pans. Perfume is added and the mixture is stirred to ensure even texture and distribution of the perfume. The whole of the driving gear for the stirrer "sits" on the tanks and one example is a small B.T.H. motor with a short covered V-rope drive to a reducing gear to which the vertical stirrer shaft is connected.

From the bottom of the crutches the liquid soap is poured into moulds for casting by cooling of half-ton blocks of soap. In slabbing machines the blocks are cut into 56-lb. slabs. On the top of a fixed frame is a small motor which, by means of reducing gear and a chain drive right round the side of the frame, pulls suitably spaced wires stretched across a movable frame through the soap block—like cheese cutting. By similar processes on other machines the slabs are cut first by horizontal movement into bars and then vertically into tablet blanks.

The blanks are next surface-dried in ovens by motor-fan produced steam-heated air currents. Electrically driven stamping machines then put the necessary impresses on the tablets which are finally dealt with by packing machines. These complete the whole of the finishing operations from the receipt of the tablets to cartoning, including wrapping and sealing, whereby "lips" of the waxed paper are placed over electrically heated plates to effect the necessary adhesion. For sealing the cartons the flaps are passed under glue rollers. Essential parts of the packing machines are the motor-driven conveyors which pass the tablets or packages from process to process.

For the production of powder soap the liquid is pumped at high pressure through spraying nozzles into a hot-air stream in a "tower" (a sort of vertical gas-fired furnace) and the powder is actually formed in air suspension. A three-throw vertical soap pump for this purpose is driven through "Texrope" by a B.T.H. 30-h.p. variable-speed a.c. commutator motor (1,450 to 495 r.p.m.). The push-button-contactor starter is strapped to the motor frame. The gas inlet to the drying furnace is controlled by a motor-operated valve which shuts automatically if (1) the gas flame goes out, when the valve is operated by a photo-electric cell; (2) the fan which pulls the air through the furnace fails, when the valve is operated through a relay by mere breakage of the fan-motor circuit;

and (3) the temperature of the stream leaving the furnace becomes too high, when the valve motor is thermostatically operated.

The powder is separated from the air stream in cyclone separators from which it falls into bins. For removing dust finally from the stream and for stripping ventilating air there is a comprehensive "Visco-Beth" sack-type filtering installation. The powder-packing plant is almost identical with that used for tablet packing.

For the production of flakes the liquid soap is pumped through electrically driven stirring apparatus and passed over and between steel rolls which cool it and transform it into thin ribbons of solid soap which are carried on "mats" through drying ovens. It is here that the major balancing between steam and electricity consumption referred is effected. Heat is required for drying the air passed over the ribbons in the oven and power is needed for driving the stirrers, fans, belts and mats. Steam used for the heating is passed through a reducing turbine which is also employed to capacity for some of the power drives, and the remainder of the driving is effected electrically.

The dried ribbons are collected at the far ends of the ovens as chips and are automatically transported by screw conveyors to mills for rolling into transparent sheets. As these leave the last rolls special cutters give them the diamond shape of the product.

The mills are arranged in two banks, roughing and finishing, and in one line all the sections are connected by a screw conveyor. The drives for these mills are a good example of the local power-factor correction schemes, as well as of suspension driving. Large "No-Lag" units hang from the ceiling girder-work. The flakes are carried by belt conveyors to storage bins whence they are fed to the packing machines. These machines are somewhat similar to the powder- and tablet-packing equipments. They make-up the carton and fill, weigh, close and seal it in one sequence of operations, for all of which, together with the linking conveyors, one motor is used.

Extensions to the plant now in progress provide for a new enterprise by Messrs. Hedley, namely, the production of cooking fats. After preliminary refining the raw materials—fats and oils similar to those used for soapmaking—will be subjected to a hydrogenation process for further refining and the removal of odours. The general equipment is similar to that used for soapmaking and will be a.c. motor driven, but the production of hydrogen on site will be effected by electrolytic decomposition of water, and this, of course, requires d.c. Crompton Parkinson have supplied motor-generator sets, each consisting of a 400-V, three-phase, 50-cycle, 750-r.p.m. unity power-factor auto-synchronous motor (another contribution to the local power-factor correction schemes) directly coupled to a 150-kW, 99-V shunt-wound generator.

To control the motors a "Klad A" switchboard has also been supplied, and each unit is fitted with a no-volt and three overload releases and is interlocked with the rotor starter. The generator control gear consists of a d.c. board, each panel being fitted with a s.p. air-break, 2,000-A circuit-breaker with overload, reverse and no-volt coils, a 2,000-A s.p. slow-break knife switch, and an ammeter for indicating the generator output.

Better Street Lighting

Departmental Committee's Final Report

THE Final Report of the Departmental Committee on Street Lighting appointed by the Minister of Transport has now been issued (Stationery Office, 9d.). Major F. C. Cook (chief engineer, Roads Department) acted as chairman, and the committee included Mr. J. F. Colquhoun (public lighting engineer, Sheffield), Dr. C. C. Paterson (director of research, G.E.C.), and Dr. J. W. T. Walsh (N.P.L.).

A summary is given of the contents of the Interim Report presented in September, 1935, in which reference was made to the advantage of transferring lighting powers to larger administrative authorities, and the provision of national grants for lighting classified roads. It was recommended, however, that the cost of lighting in excess of an appropriate standard (the total annual cost of providing and maintaining which, on "traffic routes," would be about £400 per mile) should be borne wholly by the local authority. To light all classified roads in county boroughs and 20 per cent. in counties would cost about £3.5 million per annum. Attention is now drawn to the later Trunk Roads Act, 1936, which permits the Minister to enter into agreements with local authorities for the better illumination of trunk roads. Adjoining authorities are urged to confer with a view to securing uniformity of lighting.

The earlier Report also recommended that the generously planned Class F installation of the B.S.S. should be the minimum for traffic routes, and that whenever practicable whole-time specialists should be appointed by lighting authorities.

Technical aspects are predominant in the present report, which divides roads into two groups with a definite gap between them in order to avoid uncertainty as to their classification. Group A comprises "traffic routes" giving an ample margin of safety for all persons without the use of headlamps by motor vehicles, and Group B all other lighted roads. Generally speaking, built-up areas, roads forming principal arteries of local highways and other roads to be determined by local traffic conditions fall into the first category.

Mounting Heights and Spacings

A mounting height of 25 ft. is laid down as the condition to be aimed at, and a maximum average spacing of 150 ft. with 180 ft. in exceptional spans, although 120 ft. is preferable. When the carriageway is not more than 30 ft. wide lamps should be vertically above the kerb; when it is between 30 and 40 ft., lamps should be overhung by the equivalent of one-half the difference between the width and 30 ft. On straight roads exceeding 40 ft. in width, the sources should be mounted at the kerbs with additional sources placed centrally at intervals of not more than three spans.

The central system without cut-off sources is to be avoided as making the centre of the road too bright, but there is insufficient experience to express an opinion on the merits of the system where cut-off is employed. A staggered arrangement of posts is the most suitable for straight roads on grounds of cost. On bends the sources should be placed on the outside of the curve.

The luminous output of lanterns per 100 ft. linear of road having a carriageway not more than 40 ft. wide should be between 3,000 and 8,000 lumens depending on prevailing circumstances. Except in congested traffic, objects at night are almost always seen in silhouette as dark objects on a light background. Distribution of light should, therefore, primarily produce as uniform and high a background brightness as possible, whilst avoiding undue glare.

There are two principal types of distribution in general use. In one relatively high intensities are emitted from the lantern at angles approaching the horizontal with the object of utilising the high reflectivity characteristics of the road surface at large angles of incidence. In the other the maximum intensities are directed at lower angles (60 to 70 deg.), the intensities near the horizontal being reduced, sometimes by a cut-off device.

With the first type high road brightness is obtained accompanied by some glare; in the second the road brightness is less but the glare is reduced also. No opinion can be given at present as to which is the more satisfactory type for general adoption. Excessive glare may be avoided if the ratio of the maximum candle power to the amount of light sent downward on the road does not exceed six, or preferably five. Dual carriageways should be lighted as independent routes.

For roads other than traffic routes, the mounting height should be between 13 and 15 ft. and the average spacing should not exceed 120 ft. with 150 ft. as a maximum for exceptional spans. Lantern output should provide between 600 and 2,500 lumens per 100 ft. linear and part of the light should be directed towards the lower parts of the fronts of buildings. The maximum ratio of peak c.p. to downward light is preferably three. Effective clauses dealing with adequate maintenance should form an integral part of the British Standard Specification and should be applied. Graded illumination is called for only in order to avoid abrupt change in visibility due to different lighting levels.

All-night Lighting

Street lighting should be continued from dusk to dawn except where financial conditions render this impracticable. Light-coloured backgrounds should be provided at bends and bridges. Where the police require points to be lighted for the prevention of crime, additional lamps should be erected to avoid impairing general efficiency. In public passages a number of low-power units on 13 to 15 ft. posts are better than fewer high power units at greater heights.

Detailed recommendations are given for the lighting of guard posts or refuges and reference is made to the need for placing street name plates so that they can be read without difficulty by drivers at night. Street lamps of distinctive colour should not be used as warning signs. Inadequately lighted traffic routes should be raised to the level recommended as financial conditions permit, but not to a level intermediate between Groups A and B.

Co-ordination and Load Development

By "K"

Close contact between all parties concerned in domestic electricity supply ensures correct timing of work to meet the consumers' convenience

ALTHOUGH the electrical development of the country, in both suburban and rural areas has been gratifying to the supply authorities, many years of contact with builders, contractors and consumers convinces me that even better results can be obtained when undertakings generally appreciate more fully the value of co-ordination, personal contact and goodwill:—co-ordination between supply authority, contractor, and builder (including inter-departmental co-operation); personal contact between undertaking and consumer; goodwill of the consumer (engendered by efficient service).

Many undertakings have opened showrooms, arranged lectures and demonstrations, including stalls at local exhibitions and agricultural shows, and have also installed apparatus, either on hire, or hire-purchase, and the experience thus gained by the staff should prove invaluable for future business. Generally, the supply undertakings in big centres have had showrooms for many years, and it may be assumed that the staff organisation is wellnigh perfect, possessing therefore an advantage over other undertakings which have opened showrooms within the last few years, for it is only by experience that the departmental machinery will function smoothly and efficiently.

The staff now engaged on the distribution side, who are in touch daily with the contractor, builder or consumer, should, apart from experience, possess tact, courtesy and patience. The legitimate contractor doing an honest job of work is a valuable ally in the acquisition of new business, and, therefore, nothing should be done to lower his prestige with clients and cause him financial loss. The rôle of those members of the staff who come into contact with the householder, should be that of friendly adviser, for when the consumer has been taught how to obtain maximum results without wastage, the supply authority acquires a useful propagandist.

Contact with the Builder

The usefulness of the builder, another valuable ally, is summed up in a few words: New houses mean more consumers. Owing to the rapid growth of housing schemes in suburban areas, the supply authority is sometimes hard pressed to keep pace with the demand for services. This is when co-operation with builder and contractor is most needed, and the following procedure is suggested:—If the builder has made application for services to a housing estate, and, as is sometimes the case, there is no available supply in the vicinity, a representative should meet the builder at the site, and make arrangements to have service cable only run into houses during erection. Alternatively, the builder should be asked to lay a pipe, so that a cable can be threaded through later. Either method prevents vexatious delay, the breaking up of garden paths, &c., and does not retard building operations.

The next stage is to ascertain details of installations, and if lighting only is required, the advantages of plug circuits for heating, &c., also hot-water circulators, should be discussed with the builder, the obvious fact being pointed out, that houses so equipped sell better; and that the additional cost can be added to the purchase price of houses. There are builders, of course, with modern ideas, who have installed inset fires, hot-water circulators, heating circuits, &c.; a suggestion could then be made, however, toward making house "all-electric" by running conduit containing a draw-wire to the cooker position; this would facilitate matters for the supply authority or contractor for the later installation of this apparatus if required.

On most housing schemes the builder has a show-house, and this could be electrically equipped by the supply authority by arrangement, and suitable literature distributed to potential buyers. Furthermore, application forms for supply could be left with the builder's representative. In this way the undertaking will have ample notice when the supply is required, as the builder usually knows the date upon which the buyer wishes to take possession of house. At the time the meter is fixed, show-room literature, in a sealed envelope with the consumer's name thereon can be left, prior to a canvasser's visit.

Development of Existing Load

Many consumers cannot attend lectures, &c., at the showrooms, for various reasons, and a useful accessory in these cases is the demonstration van, which can also be utilised in localities where there is idle copper. For instance, in the latter case, the consumers without cookers, &c., could be canvassed, and arrangements made for a demonstration. A temporary supply could be taken direct from the consumer's service, and certain foodstuffs provided by the householders could be cooked whilst the lecture was proceeding. A useful instrument is a kWh meter with easily detachable cover, so that the dials can be set at zero for each demonstration—to reassure the doubtful that cooking is cheap.

The efficiency of the distribution organisation can be gauged by the number of complaints which reach the supply authority's office. These can be reduced to a minimum by co-ordination, supplemented by timing in certain cases, and it is suggested that better results will be obtained if the following method is adopted.

If a consumer from a suburban district, who already has electric light, &c., installed, arrives at the showroom to choose a cooker on rental, his name and address should be elicited, and whilst the model required is being chosen, an inquiry should be put through to the mains records as to the capacity of the service; this is an important point, as the cable may have been laid many years previously, and will not carry the required demand. The consumer will naturally be annoyed if he is notified days later that a larger service cable will have to be installed before the cooker can be connected. If the supply is in order and commitments duly considered, a definite date can then be arranged with the consumer on the spot. If this is not feasible, owing to circumstances, then an approximate date can be given, and the applicant told that a notification will be sent later when the cooker will be installed.

A works order and supplementary forms filled in with full details should then be issued to the departments concerned, together with an official order to the contractor if the wiring is sub-let, with the date of completion clearly stated. Such works orders, cards, &c., should be of a distinctive colour to ensure priority over the usual departmental routine work.

With the cooker delivered, the wiring should be completed by noon of the specified day, and the installation tested and connected to the supply by the inspector and meter fixer the same afternoon. Pending the visit of a demonstrator, the inspector can explain to the consumer the cooker control, &c.

This method of procedure necessitates perfect co-ordination and timing between departments and the contractor, and as the consumer in very many cases is replacing a gas cooker by an electric one, it is essential that the change-over shall be made without unnecessary delay, otherwise the consumer will be without means of cooking, thus creating an unfavourable first impression. Furthermore, the cooker should not be installed on Monday (washing day), or Friday and Saturday, the reason for the latter being that the consumer, through inexperience, would not make a success of the Sunday dinner, in most cases the principal meal of the week. A demonstrator should call immediately and subsequent visits should be made until the demonstrator is satisfied that the consumer is proficient in the use of the cooker.

Rural Areas

A different method from that which obtains in the case of towns is advisable in the acquisition of new consumers in rural areas. Farmers in outlying districts are usually reserved in the presence of townsfolk, and it would be a bad mistake to adopt a "superior" attitude. All that is required is a little common sense, tact and patience, and then it will be found that the farmer is a capital fellow to do business with. Once he has decided to adopt electricity for lighting, the demonstration van can be utilised later with advantage, in demonstrating apparatus for farm and field. In particular, the poultry farmer is a potential source of profit, with a good off-peak load, but, however, for only about six months in the year.

Mushroom culture (indoor) is a desirable load from the supply point of view, with practically a continuous demand all the year round. Unfortunately for this industry, electrical apparatus is usually improvised; consequently, the grower does not reap the economic advantage that would be obtained if proper apparatus were available for circulating warm air and providing the top heat which is essential. As a supplementary aid to canvassing and demonstrations, current literature appertaining to industries in rural areas could be mailed periodically to prospective and existing consumers.

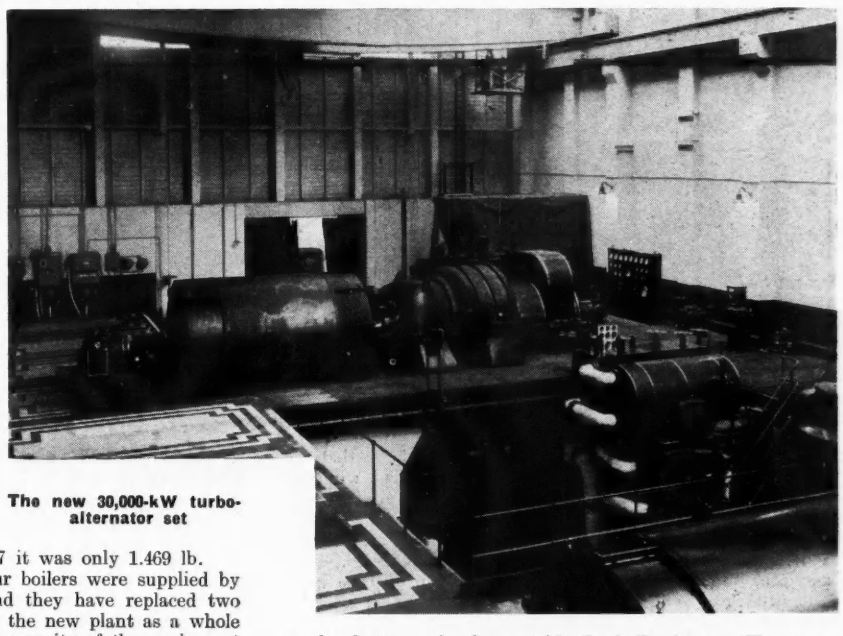
New Plant at Hull

A 30,000-kW extension

Generation at 22-kV is an innovation at Hull. Isolation of the switchgear is another notable feature

"SCOOPING the steel market," was how Mr. J. N. Waite, general manager and engineer of the Hull electricity undertaking, explained the early commissioning of the new 30,000-kW extensions at the Sculcoates Lane generating station which were inaugurated last week by Alderman Frederick Holmes, Lord Mayor of Hull, and chairman of the Electricity Committee. In common with several other undertakings Hull received its direction for the extensions from the Central Electricity Board in March, 1936, but this is believed to be the "first of the batch" to be completed by probably some months. Contracts for the main plant were placed within a few days of the receipt of the direction, so that construction was under way before the present steel-delivery difficulties arose.

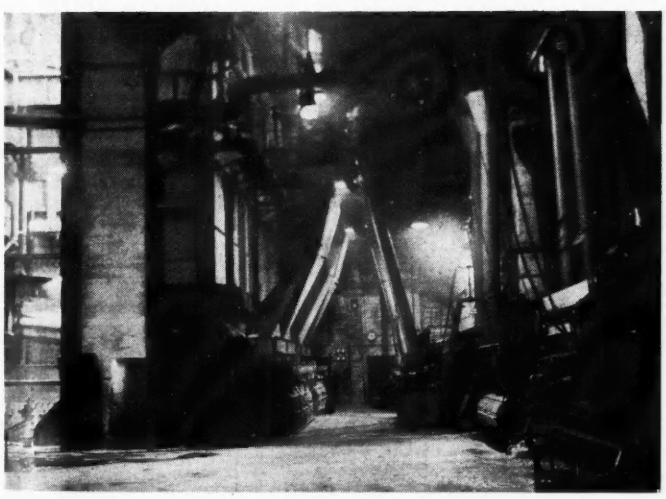
The new 30,000-kW turbo-alternator has replaced a 10,000-kW set which was installed in 1923, and the present 97,000 kW of generating plant is composed of two 7,000-kW and two 14,000-kW Brush - Ljungstrom sets and a 25,000-kW set and a 30,000-kW set supplied by C. A. Parsons & Co., Ltd. The 25,000-kW set was installed only two years ago and the improvement in the station working as the result of its operation, shown by the following coal-consumption figures, is likely to continue as use is made progressively of the new plant. In the year 1934/35 the coal consumed at the station was 1.571 lb. per kWh generated; in 1935/36 1.51 lb.; and in 1936/37 it was only 1.469 lb.



The new 30,000-kW turbo-alternator set

The two new 187,500-lb. per hour boilers were supplied by Clarke, Chapman & Co., Ltd., and they have replaced two 52,500-lb. per hour boilers, so that the new plant as a whole may be said to have increased the capacity of the equipment for the same floor space by about three times.

Coal is delivered to Sculcoates by rail and nine new marshalling sidings will increase the accommodation for coal wagons sufficiently to meet the ultimate requirements of the station. The existing coal-handling plant for the older boilers is being augmented by a further gravity bucket coal conveyor of 60 tons per hour capacity, supplied by Spencer (Melksham), Ltd., and a further elevator of 100 tons per hour capacity, which will raise coal from ground level to the central distributing hopper, is being installed.



The 187,500-lb. per hour boiler plant just installed

A special feature of the new boilers, each of which has a maximum continuous evaporative capacity of 187,500 lb. per hour at 400 lb. per sq. in. and 825 deg. F., is the large combustion chambers which, it is claimed, will ensure complete and smokeless combustion. Each boiler is equipped with two travelling-grate stokers of the Underfeed L type (International Combustion Co., Ltd.), each grate being 12 ft. wide by 23 ft. long. With each boiler there are also a Heenan "twin tube" steaming economiser and two Howden-Ljungstrom air preheaters. These and the f.d. and i.d. fans were supplied by J. Howden & Co., Ltd. "Melesco" superheaters supplied by the Superheater Co., Ltd., are also part of the equipment. The ashes are removed by a hydraulic sluicing plant and pumped to an overhead storage bunker outside the boiler house. The guaranteed final exit-gas temperature is 240 deg. F. and the guaranteed efficiency of the boilers is 86 per cent. at normal load.

The new turbine is a single-cylinder, 68-stage reaction machine. The blades are of stainless steel, with the exception of the last two rows which are of mild steel fitted with special erosion shields on the leading edges. The lubricating system is fed by an auxiliary steam oil pump, and a very high-pressure oil pump "floats" the rotors by hydrostatic pressure when starting up and during "barring." Three-stage bleeding for feed-heating on a regenerative cycle is employed, the final feed temperature being 315 deg. F. The initial steam conditions are 375 lb. per sq. in. and 800 deg. F. The guaranteed heat consumption of the complete set at the economical load is 10,800 B.th.u. per kWh.

The condenser has a cooling surface of 24,300 sq. ft. and the circulating water is supplied by a Mather & Platt pump which delivers 19,750 gal. per min.

The power station stands on the bank of the Beverley and Barmston drain which discharges into the River Hull through non-return tidal doors at a point three-quarters of a mile from the station. Make-up and circulating water is obtained from the drain which, because of its low level, can only discharge at low-tide periods. In the past this has limited the use of the drain for circulating purposes and necessitated the use of cooling towers. By agreement with the River Hull Catchment Board, however, arrangements have been made to enable the limitations to be overcome. Two 2-million gal. per hour pumps have been installed at the outfall of the drain, so that when the doors shut on rise of tide, the pumps can be brought into operation to pump water from the drain into the river and so maintain a flow of water past the power station, and thus enable full use of the drain to be made for circulating-water purposes.

Further, at a point some miles above the power station, a connection has been made between the River Hull and the drain through sluice gates for the purpose of augmenting the flow of water down the drain during drought periods. Both the sluice gates and the pumps are remotely controlled from the power station, and the control gear is equipped with distance level recording indicators. The scheme has eliminated the necessity for additional cooling-tower capacity, and the pumps will also be of material assistance to the Catchment Board during heavy rainfall periods.

Generation directly at 22 kV is a new departure for the undertaking as all the earlier sets generate at 6.6 kV. The rated capacity of the new alternator is at 0.8 p.f., so that the equipment has a total capacity of 37,500 kVA. The windings are of the makers' concentric design and the alternator is equipped with Merz-Price balanced protection.

To deal with the higher-voltage supply ten armour-clad switch units have been supplied by A. Reyrolle & Co., Ltd., and each breaker has a rupturing capacity of 750,000 kVA. The switchgear is of the double-bus-bar type, bus-bar selection being effected by motor-operated oil-immersed selection switches. The generator panel is rated at 1,200 A and is equipped with overload and Merz-Price protection. The non-automatic bus-bar coupler switch has a capacity of 1,200 A.

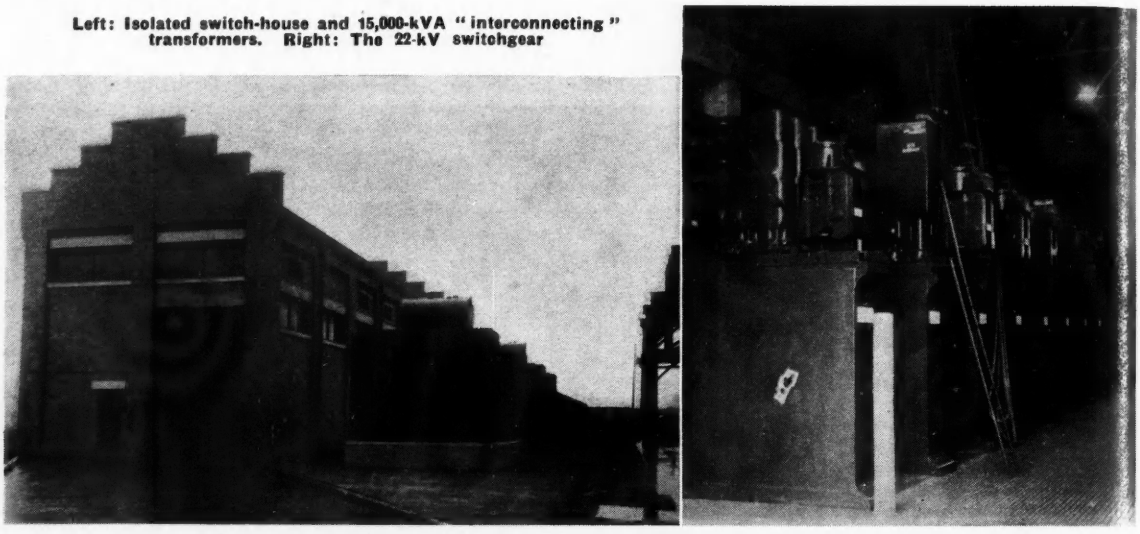
Six of the units, for outgoing feeders, are of 400-A capacity while two of them are equipped also with earth leakage protection. Two 400-A transformer breakers are equipped with overload and "Howard" earth leakage protection. A new slate-panel cubicle control board for this remotely controlled solenoid-operated 22-kV switchgear has been installed in the existing station control room.

Expression of the recently changed outlook in switchgear housing is found in the new steel-framed, brick, single-storey switch-house, which has been erected at a considerable distance from any other building. This house is equipped with CO_2 fire-extinguishing equipment and a gas-extraction plant, and there is provision for drainage of oil to a pebble-filled pit. No cable and are equipped with split pilot and overload protection, basement is provided, the cables being run in the solid earth up to the switch-house, so that fire and explosion risks have been reduced to the minimum.

The two new 15,000-kVA oil-immersed, outdoor 22-kV to 6.6-kV transformers, supplied by the Metropolitan-Vickers Electrical Co., Ltd., form the connecting link between the 6.6-kV bus-bars and the new 22-kV bus-bars. They are fitted with tap-changing equipment on the high-voltage side and are remotely operated from the station control room.

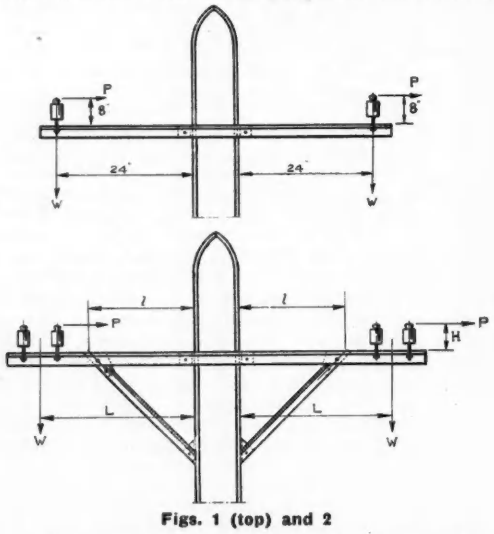
The foundations for the turbo-alternator and the boilers were constructed by Tarran Industries, Ltd., and new sluices were supplied by J. Blakeborough & Sons, Ltd. The extensions were designed to the specification of Mr. Waite.

Left: Isolated switch-house and 15,000-kVA "interconnecting" transformers. Right: The 22-kV switchgear



Stresses on Cross Arms and Brackets

WHILE the required strength of insulators and conductors is governed by the Regulations of the Electricity Commissioners, full attention is not always given to the design of cross arms and brackets. It is important that these members should be considered in detail, as the safety of a line is just as dependent on secondary members as on the structure as a whole.



Figs. 1 (top) and 2

The following examples show typical loadings and methods of arriving at the stresses in the members. In fig. 1 the total stress on the arm (direct stress+bending stress)=P/A+M/Z, where P is 250 lb., A is area of cross arm (2½ by 2 by $\frac{5}{16}$ angle). =1.31 sq. in., W is 120 lb., M is bending moment, and Z is section modulus=0.453 in.³. Then direct stress=250/1.31 and bending stress=(120×24)+(250×8)/0.453, so that maximum stress=191+10,773=10,964 lb. per sq. in. Although this stress is well under the safe working stress of 14,400 lb. per sq. in. specified by the Electricity Commissioners it is not advisable to reduce the size of section to a minimum from a practical point of view.

In fig. 2 the load on the right-hand diagonal is $(W\times L)+(P\times H)\times\sqrt{2}/l$ which is a maximum. The load on the left-hand diagonal is equal to $(W\times L)-(P\times H)\times\sqrt{2}/l$.

The following factors of safety for supports are permissible under the Electricity Commissioners Regulations: Iron or steel 2½, wood 3½, reinforced concrete 3½.

These factors are based on the crippling load for struts and the elastic limit of tension members.—L. F. VILLIERS.

Basis of Assessment Criticised

The making of the rate (7s. 6d. in the £) for the ensuing half-year was made the occasion by Mr. W. S. Lewis for a plea that the Birmingham City Council should consider the present unequal distribution of rating incidence. According to *Rating and Income Tax*, he pointed out that while the ordinary householder was paying rates at 15s. in the £, manufacturers were paying only 3s. 9d. in the £, and as a result many householders were being compelled to lower their standard of living in order to meet their rating obligations. Mr. A. F. Bradbeer said that one of the City Council's own trading departments—the Electric Supply Department—was contributing more in rates to the city than the whole of the industrial hereditaments put together.

Air Conditioning. By E. M. Ackery, B.Sc.

A universal need

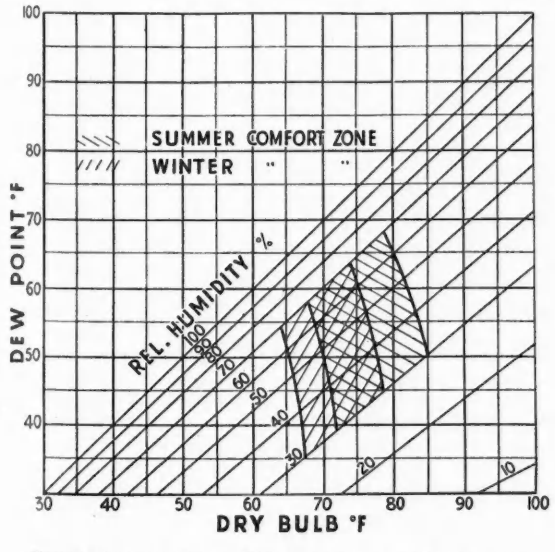
IN view of a quite common lack of understanding as to what air conditioning really is, it is as well to emphasise at the outset that it is not a catch-phrase that can be interpreted according to individual opinions. It is defined in the Encyclopedia Britannica, which states that " the term is derived from the word ' conditioning,' which was applied to the determination of the moisture content of textiles, and covers the treating of air in an enclosure to regulate its moisture content, temperature, purity, and usually its circulation. For human comfort and for the manufacturing or processing of certain materials an accurate control of the moisture content of the air is most important. . . . The relation of moisture, temperature, and air motion to human comfort and physiological efficiency has been the subject of much research, which has determined the points of equivalent comfort or temperature sensation. A mathematical curve can be drawn showing the relation between temperature and humidity which will give the same sensation of temperature. Such a curve is called an ' effective temperature ' line. Temperature alone, even when automatically controlled, does not determine comfort. Humidity is equally important. The proper relation between temperature and humidity can only be maintained by complete conditioning."

What is air conditioning? The author defines it and shows the immense scope which it offers to the supply industry

Much of the equipment described as "air conditioning" does not comply with the definition given in the Encyclopedia Britannica. A few years ago, when public interest in air conditioning in the United States was comparable with that now existing in Great Britain, the Air Conditioning Manufacturers' Association defined true air conditioning, and the Federal Trade Commission forbade an improper use of the term. If these steps had not been taken the future of air conditioning might have been badly set back due to lack of public confidence bred by the shortcomings of pseudo air-conditioning installations.

Not True Air Conditioning

Let us be quite clear on this most important point. A convector fitted with a fan to give air circulation may well be an improvement on one that relies on natural air circulation, but it is not air conditioning. Even if an air filter is added, or sprays for cleaning the air and adding humidity, it is still not air conditioning. There always has been, and there probably always will be, a need for heaters, ventilators, extract fans and air purifiers, but these should be clearly labelled for what they are so that the public may not expect them to do more than they are capable of doing. It does not need much imagination to see that the future of air conditioning is well assured. The human system has much to put up with, and a great deal of this is due to the atmosphere in which we are forced to spend most of our time.



Temperatures and humidities consistent with comfort

In winter heating systems often cause an undue lowering of humidity so that the mucous membranes of the respiratory tracts are unduly dried, a condition that leads to colds, influenza and similar troubles. In summer we have to choose between stuffiness and constant noise, dust and dirt, and draughts from open windows. At all times we have to contend with constantly changing temperatures and humidities. True air conditioning does away with all this.

Many industries have found the need for controlling air conditions, and a considerable number of plants are in operation in this country. One British concern alone installed in the course of a single year air-conditioning equipment of various types and sizes using approximately 14 million kWh per annum. Manufacturing needs and competition determine the rate of development of industrial air conditioning, and the supply industry can do little to help it. Very much the same applied to air conditioning for personal comfort so long as the only equipment available was of the same type as that used in industrial work, that is, central plant with a system of ductwork to distribute the conditioned air to where it was required, and needing structural alterations to accommodate it.

Humidity has a profound effect upon the sensation of comfort, and is second only in importance to temperature. The effect of humidity is not constant. Greater humidity will make a high temperature seem higher, but will make a low temperature seem lower. This is the reason why visitors to our country feel both the heat and the cold even when they come from climates where temperatures are much higher or lower than those we experience.

The range of temperatures and humidities consistent with comfort are shown on the accompanying chart. A study of the comfort zone indicated shows that the maximum dry-bulb temperature consistent with comfort is 85 deg. F. This is, however, only permissible when the relative humidity is 30 per cent., a very low figure for this country. If the relative humidity is 70 per cent., a condition that often obtains, the maximum dry-bulb temperature consistent with comfort is only 78 deg.

Another point must, however, be watched. It does not matter in winter how much the temperature difference between outside and inside is, but in summer too large a difference must be avoided. An internal temperature of 70 deg. F. will feel distinctly chilly even if the relative humidity is correct when the outside temperature is in the nineties. A drop of about 15 deg. is quite enough for places that are not continuously occupied. Taken by and large, a temperature of 65 deg. F. dry-bulb and a relative humidity of 55 per cent. is probably the best condition to aim at.

On a winter day a common condition of external temperature and humidity will be 45 deg. F. and 80 per cent. relative humidity. If this air is warmed to 65 deg., without adding humidity, as happens with ordinary heating methods, the relative humidity will fall to 40 per cent. If the external temperature is only 30 deg. F. with 80 per cent. relative humidity, the corresponding figure when the air is heated to 65 deg. F. is 21 per cent., and that is drier than the Sahara Desert!

In summer if the air is at 80 deg. F. and 50 per cent. relative humidity outside, the relative humidity will rise to 85 per cent. if the air is cooled to 65 deg. without dehumidification. These figures show quite clearly that humidity cannot safely be left to take care of itself.

Air Cleaning

Few people realise just how dirty the air in large towns really is. At a recent smoke-abatement exhibition a specimen of dirt washed out of London air was on view. It was almost unbelievably disgusting, a jet-black slimy jelly with a most offensive smell. We swallow about ¾ oz. of such stuff every day, and the fact that we survive is no reason why we should not do everything possible to minimise the quantity.

The usual type of filter employed for air conditioning is of the viscous type operating on the adhesive impingement principle. Dirt and dust are trapped and retained by successive impingements on coated surfaces. The first impingement retains about 60 per cent. of the dust, the next about 60 per cent. of what remains, and so on. In practice the filter retains about 95 per cent. of the dust and dirt in the air.

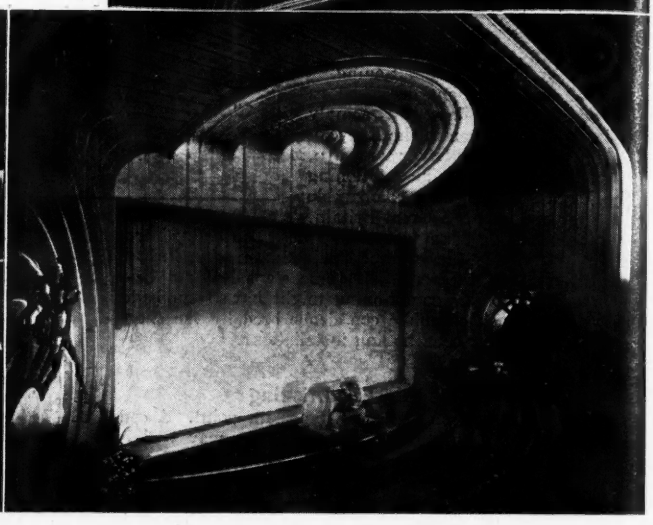
For adequate ventilation and circulation the quantity of conditioned air delivered to a room should not be less than 1,000 cu. ft. per person per hour, but it need not all be taken from outside, as this would lead to excessive consumption of power

The Odeon Cinema

Electrical equipment and air conditioning

ERECTED on the site of the old Alhambra Music Hall in Leicester Square, the Odeon Cinema which was opened on Tuesday has at least one great advantage over its famous predecessor in coming into being in an age when electrification can do so much towards promoting the comfort of the audience as well as the efficiency of production. Accommodation is provided for 2,300 persons, and many novel features are embodied in the installation. For example, in the film-projection and sound reproducing apparatus, which was manufactured and installed by the British Thomson-Houston Co., Ltd., there is a new volume-expansion circuit, which has been designed automatically to compensate for the restriction of the recording amplitudes. The object of this is to accommodate the latter on the standard sound track, and thus to reproduce the full frequency range.

The amplifier rack comprises the main amplifier, a rectifier panel, a monitor control panel, an amplifier for deaf-aid headphones, and independent rectifiers for supplying the exciting lamps and the main amplifier. All the sound-reproducer fuses



The exterior, foyer and auditorium of the new Odeon Cinema, showing the excellent lighting arrangements [*Elec. Rev. photos.*

Air Conditioning (*Continued from previous page*)

for heating or cooling. As a general rule if 25 per cent. is fresh air and the rest is recirculated satisfactory results will be obtained, although if there is much smoking in the room the proportion of fresh air should be increased.

The whole aspect of air conditioning for human comfort has been altered by the introduction, at a reasonable price, of the true unit type of equipment, and this is a development that is full of interest to the supply industry.

Although air conditioning may still be considered generally as a luxury, this does not mean that the prospects of development are small, as yesterday's luxury is to-day's necessity. It is not long since the refrigerator was regarded as being suitable for America with its severe climate, but far too much of a luxury for the British public. To-day the refrigerator industry is in a healthy and thriving condition, due simply to a general change of outlook.

In the United States to-day, air conditioning is becoming of real importance to the electricity supply industry. A recent survey puts the existing load at 600,000 h.p. and points out that the total is increasing by leaps and bounds and the possible future loads run into astronomical figures. In Great Britain, within six months, unit-type equipment using over 500,000 kWh per year has been installed.

The need is so universal that the only limit to development is the willingness of people to pay the price, and it should be easier to convince the public as to the value of air conditioning than even of domestic refrigerators.

A unit-type air conditioner costs in round figures £100. The installation in the majority of cases consists of a short duct connection from the back of the unit to the window, which is permanently raised a few inches, and the provision of a power point.

There must be a vast number of people willing to pay this sum for ideal air conditions on tap, and for the ability to shut out noise and dirt at all times of the year. The business man can fit double windows to his office and have them permanently shut. This alone, apart from the greater freedom from colds and sore throats, makes it worth the price; in many offices the carpet alone costs more. The permanent invalid is given relief from summer heat and the hay fever victim need no longer fear the spring, while the problem of overcrowded rooms can be overcome.

The unit air conditioner provides a definitely "all-the-year-round" demand with a good load factor. It has a loading of 3 kW, consisting of a ¾ h.p. compressor motor, a 1/30 h.p. high-pressure fan motor, a 350-W immersion heater for humidification, and 1¾ kW for heating. As a general rule the compressor and the heaters do not run together, and the consumption averages 1 kWh per hour in winter and ¾ kWh in summer for eight hours per day. The diversity factor of a number of units should be very good.

In one respect the supply industry is more fortunate in Britain than in America, where heating is almost always done by some form of fuel-fired central-heating installation. What this is tending towards in America is illustrated by the case of one Middle West utility, which during 1936 had a peak of 107,000 kW, occurring in February. The summer peak was 97,000 kW at a time when the air-conditioning load was about 9,000 h.p. A recent survey of the area served indicated a probable addition of 64,000 h.p. of air conditioning in the next ten to twenty years, and showed that in a short time there would be a decided summer peak.

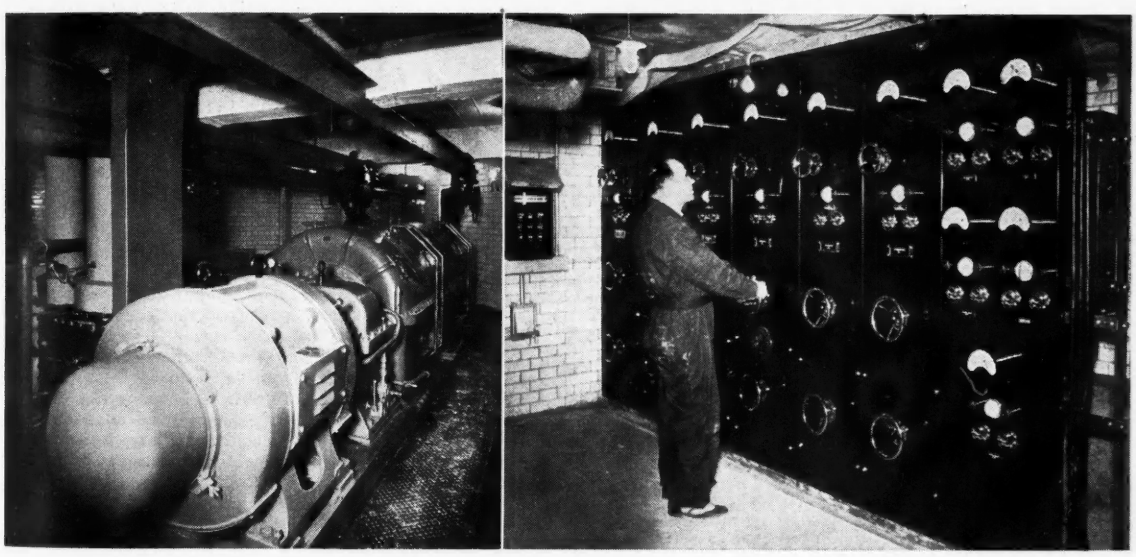
The inclusion of electric heating as a part of air-conditioning equipment will prevent this happening over here, and although, in the face of the growing winter peak problem, it might appear that this is a drawback it is not really so. The important point is that electric heating is getting in on the back of air conditioning. It is often difficult to persuade a consumer to install electric space heating because he does not consider that the advantages compensate for the increased fuel costs as compared with, say, coke heating. When this heating is, however, merely one of the functions of an air conditioner, he is not likely to object to the running costs because air conditioning is an entirely different service.

are contained in one panel. Condensers and transformers are mounted on the back of a vertical tray, which also carries the input switch, range switch (for restricting the frequency limits to suit a poorly recorded film) and a milliameter, as well as the valves and input transformer. Three rectifiers (one spare) supply current to either the screen or stage amplifying loud speakers. Two items introduced by Sound & Equipment, Ltd., for the first time, we believe, on a permanent basis are an integrating photometer for checking the working of the projectors and a sound-intensity meter for indicating the volume of sound at the back of the cinema and thus the fader setting required for different numbers of people in the auditorium. The microphone for the latter is connected through a rectifier circuit to a sensitive galvonometer in the projection room. Controlled from the projection room in an adjacent compartment is a 35-kW twin glass-bulb mercury-pool rectifier and an emergency lighting rectifier.

At the back of the stage is a portable loud speaker combination composed of low-frequency units mounted in a common baffle and high-frequency units in two multi-cellular horns on top of the baffle. The loud speakers are fitted with separate circuits to eliminate distortion.

Of the nine microphones of the stage amplification system, two are portable and one is on the console of the Compton organ, three disappear below stage level with the footlights to make room for the stage extension, which when raised brings the other three into position. The amplification speaker system is separate from the main cinema speakers. The amplifier is fed from the microphones through a mixing panel which will cope with any four microphones and a gramophone.

The equipment for controlling (from either the stage or the projection room) over 180 kW of lighting on the fifty-two stage and fourteen house circuits is said to be the largest in Europe or in the Empire. Its chief feature is a thyratron reactor dimmer, *i.e.*, a rectifier valve the d.c. output of which is governed by the voltage applied to the grid circuit. As the Odeon is to be used for both cinema and stage shows two control boards have been installed. One of these provides for the pre-setting of complete scenes to any degree of lighting intensity; the area occupied by the controls is only 73 by 40 in. Automatic increase or dimming of the 6,000 "Mazda" lamps used in the cinema can be brought about in sequence by a motor-driven cam system operated by a single push button.



Rotary water-vapour refrigeration plant and (right) the control board [*Elec. Rev. photos.*

Colour effects are produced in the concealed indirect-lighting system of the auditorium (without the use of screens) by reflection from the coloured wall and ceiling surfaces. For the stage and proscenium arch, colour is obtained through screens on the lamp fittings. Extensive use has been made of "Mazda" light tubes in the foyers, where Troughton and Young fittings with Pryde glassware are used. Emergency lighting is available from Ediswan batteries. The Strand Electric Co. provided batten lighting, stage floods and circle spots, Jensen's the organ and microphone lifts, and Knights the electrical control of the fire-curtain. Pearce neon signs are used in front of the building and Shaw moving neon over the front entrance. A Sturtevant vacuum plant is employed for cleaning the theatre.

Air-conditioning Plant

The air-conditioning equipment is designed to provide 1,200 cu. ft. of washed air per person per hour at a temperature of 68 deg. F. with 57 per cent. relative humidity. For removing excess moisture from the air on lowering its temperature a water-vapour refrigerating plant has been installed by Vacuum Refrigeration, Ltd.

In this plant—said to be the first of its kind in Great Britain—the water required for the spray washer is chilled to 45 deg. F. by being circulated at the rate of 800 gal. per min. through a vessel kept under high vacuum. The temperature of vaporisation decreases with a fall in absolute pressure, and latent heat is taken up from the water until its temperature falls to a value at which the vapour pressure is equivalent to that existing in the vessel. The vacuum needed for obtaining the reduction in temperature is maintained by extracting the vapour as rapidly as it is produced. The apparatus used consists of a centrifugal water-vapour extractor and compressor, a flash-type water evaporator, a surface-vapour condenser, a dry vacuum air pump and a cold water extractor and delivery pump integral with the flash evaporator.

The surface condenser and dry vacuum pump create an absolute pressure in the evaporator of from 1¼ to 2 in., according to the temperature and quantity of the condensing water. The pressure in the evaporator is further decreased to the value needed for giving the required temperature to the water by means of the vapour compressor. The latter also extracts and compresses the vapour to the same pressure as that in the condenser to which it passes before it is returned to the evaporator feed. Almost automatic regulation is obtained owing to the large variation of vapour volume with slight differences in temperature. The duty of the plant is to remove 2,400,000 B.th.u. per hour. As the power taken at full load is 185 b.h.p. this is equivalent to 0.925 h.p. per ton of ice melted.

Before being conveyed to the auditorium, the air (1¼ tons per min.) passes through a spray-type washer in which its temperature and humidity are corrected. About three-quarters of this air is extracted from the theatre by ducts under the balcony and stall seats and through the proscenium arch, the remainder creating a slight pressure in the auditorium so as to exclude draughts. Electrical indicators show the temperatures at eight points in the auditorium.

A scheme of centralised operation has been evolved in which the constant-speed motors have contactor starters adjacent to them, but controlled by push-buttons from the main switchboard, and the variable-speed motors have their rotor leads brought back to the switchboard to permit the use of face-plate starters and coupled regulators as required for simultaneous variation of fan speeds. The lay-out was a difficult one on this account, and also because of the L.C.C. Regulations calling for sequence control of some motors. Eight motors with an aggregate h.p. of 360 (including the main unit of 200 h.p.) with their control gear were supplied by the B.T.H. Co. in connection with the air-conditioning plant.

The architects for the building were Mr. A. Mather and Mr. H. Weedon. Mr. S. B. Swingler, engineer-in-chief Odeon Theatres, Ltd., was responsible for the installation of the plant described. Mr. A. J. G. Mohring was retained as consultant for the auditorium and front of the house, for which Troughton and Young were installation contractors, and Mr. Asdaile for the stage work, for which the Etna Lighting & Heating Co. were contractors. Supply is taken at 440 V from the 11-kV sub-station of the Charing Cross Electricity Supply Co. *via* two l.v. sub-stations fitted with English Electric distribution gear.

Electricity Supply Prospects

Presidential address to the "Civils"

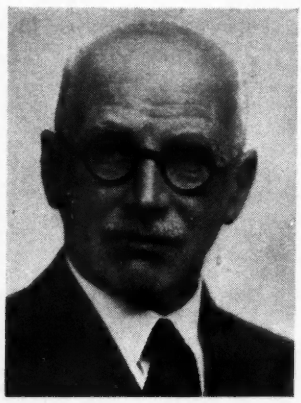
Mr. S. B. Donkin predicts a consumption of 600 kWh per head by 1950 at an average price of 1d. per kWh

A FORECAST of increased use and decreased cost of electricity was made by Mr. S. B. Donkin in his presidential address to the INSTITUTION OF CIVIL ENGINEERS in London on November 2nd. In presenting a somewhat heterogeneous collection of facts and prospects he pointed out that the present lowest cost of generating electricity in statutory selected stations, including capital charges, was of the order of 0.2d. per kWh. If the electricity generated by statutory authorities at an average cost of 0.4d. per kWh could be produced at the lowest cost, corrected for the average load-factor, the saving would be of the order of £9,000,000 per annum.

The kWh sold by authorised undertakers in Great Britain per head of population for 1935-36 was 330, so that the estimated rate of increase (Weir Report) had been realised. Mr. Donkin predicted that by 1950 the total sold per annum would be at least 30,000 million kWh, while the kWh sold per head of population would be of the order of 600. The average price of electricity should also fall from 1.125d. per kWh, the figure for 1935-36, to a little below 1d. per kWh in 1950.

He traced the steps by which the present great improvement in the cost of steam generation had taken place and referred also to the possible advantages to be obtained by means of the internal-combustion engine, since the overall thermal efficiency of oil to electricity had increased from about 18 per cent. in 1892 to about 36 per cent. in 1936. Those in favour proposed by the use of a greater number of small stations to reduce the cost of transmission and to avoid the concentration of large blocks of plant in the more isolated steam stations. The solution of the problem, however, was primarily one of cost, although it had also to be one of political economy.

The Electricity Commissioners' latest returns showed that the capital expenditures on generation per kW of maximum demand for the smaller Diesel-engine stations and for the larger steam stations were of the same order, but they also showed that the working costs per kWh generated were more than three times as great for small Diesel stations as for the larger steam stations, in spite of the fact that the thermal efficiency of the Diesel stations was about 50 per cent. higher. That indicated, among other things, that with present-day fuel prices Diesel generating stations were fairly competitive with steam stations for limited demands and low load-factors, including peak-load stations. The failure of the Diesel stations to give low working costs was, of course, mainly due to the high cost of fuel oil.



Mr. S. B. Donkin, President of the Institution of Civil Engineers

The president referred also to the advantages to be obtained from the combination of the supply of electricity with that of heat in the form of steam or hot water, for industrial or domestic purposes. While the best annual thermal efficiency in 1936 (Battersea station) was 27.63 per cent., that figure might be compared with that of an actual industrial thermal-electric station supplying 36 lb. of steam for heating for every kWh sent out, where the annual thermal efficiency was 65 per cent. Taking as an example a figure of 18d. per 1,000 lb. as a remunerative standard price for the supply of steam heat, Mr. Donkin said that the cost of supplying electricity, with the ratio of, say, 30 to 1 of steam to electricity, would be only 0.14d. per kWh.

Reference was made to the possibility of the economic use of water-power for peak-load purposes only, either daily or annually, consequently incurring a lower total capital expenditure per kW of installed plant. Another important development of such peak-load hydro-electric stations was the use of natural reservoirs below the stations from which water was pumped to the high-level reservoir during off-peak periods. A number of such systems had been installed in Europe, but so far none had been built in Great Britain.

Putting on one side all political aspects and considering the matter on a purely hypothetical basis without reference to other possibly unknown factors, certain comparisons between the cost of electricity generated per kW-year in steam stations and in hydro-electric stations, when plotted to a base of varying load-factor, showed that water-power at £35 per kW installed, with interest at 5 per cent. per annum, was more economic than steam power costing £18 per kW installed with coal at 10s. a ton if the load-factor of operation exceeded 45 per cent. Another example brought out that water-power at £35 per kW installed, with interest again at 5 per cent., was more economic than Diesel oil-engine power costing £18 per kW installed with fuel oil at £4 a ton if the load-factor of operation exceeded 7 per cent. It could also be inferred from the figures that water-power could be economically used for peak-load purposes at, for example, 10 per cent. load-factor, when the total cost of its works did not exceed £30 per kW installed.

One example of the gain in economy that had resulted from the passing of the 1926 Electricity Act and the operation of the Central Electricity Board's system, was that the percentage of standby to total plant installed was only 34 per cent. in 1935-36, whereas in 1926 it was about 70 per cent. If the cost of electricity to the consumer was now very variable and in many cases still far too costly for it to be a real commodity, the cost of distribution was more at fault than generating cost.

During the period 1924 to 1933 the average total distribution costs per kWh sold by authorised undertakings in Great Britain increased from 0.7573d. to 0.7664d. per kWh, although expressed as a percentage of distribution capital they fell from 15.16 to 13.13 per cent. During the same period the energy sold per £1 of distribution capital decreased from 48.04 to 41.13 kWh. Since 1933 the figure had recovered somewhat to 46 kWh, which indicated the necessity for reducing working costs and for distributing the largest possible number of kWh over a distribution system of given capital expenditure. It should not necessarily be argued that the large increase in rural distribution was bringing about such an increase, as it could be shown from recent experience that the capital expenditure per consumer on distribution in certain rural areas was less than that in many urban areas, and the capital costs per consumer for the country as a whole had decreased steadily in spite of the development of the supply in rural areas.

To an impartial critic the recommendations of the McGowan Report as regarded the compulsory amalgamation of the smaller undertakings with the larger to form greater single entities was correct in principle. It was only the proposed methods of amalgamation which were subject to criticism. Mr. Donkin showed by graphs how the total annual cost of distribution and the total revenue per consumer both increased with the demand. The cost of underground cables was stated to be from three to six times greater than that of overhead lines, over a range of voltage from 6,600 to 33,000. The practical value of overhead earth-wires depended on the resistance to earth of the towers being so low that the tower potential due to lightning was less than the flashover voltage of the insulators. It was, therefore, obvious that earth-wire protection would not be effective below a given figure of line insulation, and hence the well-known experience that the higher the voltage of any transmission line the less was it likely to be adversely affected by lightning.

In Great Britain, during the last six years, the number of faults on the Central Electricity Board's overhead system due to lightning was only 20 per cent. of those due to all other causes. In connection with the help given by the British Post Office authorities in locating faults on transmission lines, Mr. Donkin referred to an interesting development that had recently been tried to enable faulty line-insulation to be detected, before failure, by means of a portable wireless set.

The electricity supply industry had been blamed for continuing to charge excessive prices for electricity. The Belgian "Sofina" company in its annual report for 1936 showed by comparing the cost of various domestic commodities throughout Europe, ranging from electricity to coal and including butter, bread, milk, meat, potatoes and sugar, that the price of electricity had fallen more since 1914 than that of any other commodity, while the price of electricity in Great Britain had fallen more than in any other country.

(*Continued at foot of next page.*)

Advances in Illumination

Recent research activities

An inspection of work in progress at the extended G.E.C. Laboratories, Wembley

A WING has recently been added to the Research Laboratories of the General Electric Co., Ltd., at Wembley, which were constructed seventeen years ago. The new part comprises two main laboratories, which can be thrown into one room 90 ft. long, two subsidiary laboratories, photographic dark room, workshop, projection room and offices. A cantilever platform at gallery level in the main rooms enables apparatus to be erected at any height up to 20 ft. above the floor. North light can be admitted through roof windows fitted with motor-operated blinds.

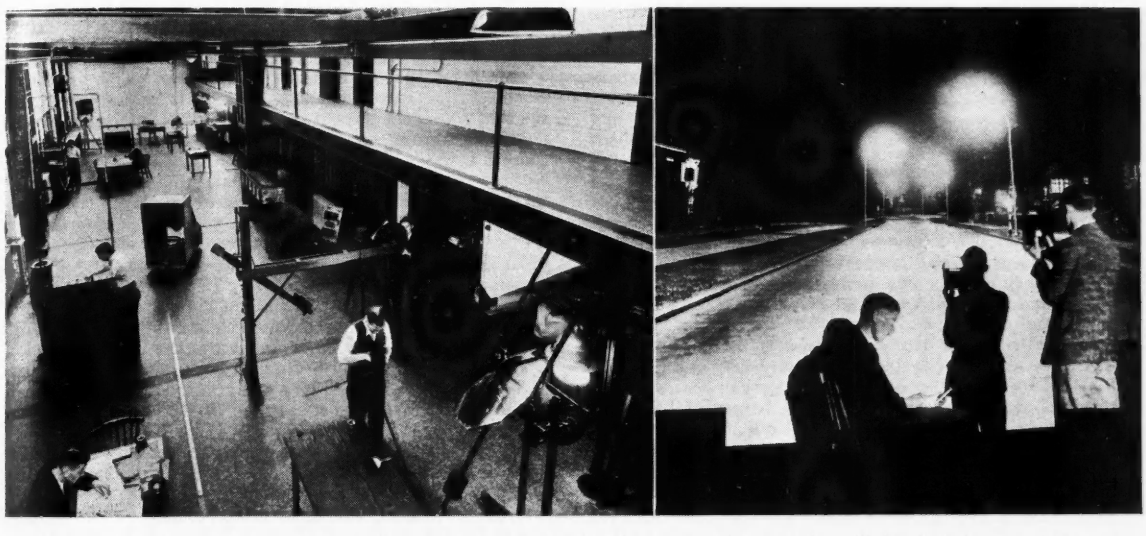
In the south main laboratory are three photometers for determining light distribution curves. In one the form of distribution is obtained by reflecting the light from the unit under test at various angles on to a visual sector photometer by means of rotating and fixed mirrors, measurements being made photo-electrically. The other two photometers are of the semi-automatic photo-electric type, in which the photo-cell revolves round the fitting being tested and the polar curve is quickly plotted by following the deflection of a galvanometer spot on rotating paper.

The north laboratory is left clear for illumination tests in lighting units under practical conditions. A few days ago we were shown in this room a new track-indicating beacon for aircraft; practical conditions (including a model aeroplane cockpit) were reproduced on a 1,000 to 1 scale corresponding to 20 miles and to a height of 3,000 ft. Here, also, was a bank of "Gecoray" reflectors arranged as in a shop window and equipped with 80-W "Osira" and 100-W "Osram" lamps to give an approximation to daylight. Dr. C. C. Paterson, director of the laboratories, also showed us a method of building up synthetically the actual effect of varying the spacing of street lamps, 25 ft. high, by photographing a single part from varying distances and projecting reproductions on a screen.

Various types of housing, such as refractor lanterns for street lighting and optical designs for giving either wide or concentrated beams for cinema and television studios were on view in this room. Another item was a mercury-vapour lamp (without water cooling) which is still in the experimental stage; this has a brilliance fifty times as great as that of a filament lamp, and the small source of light enables optical mirrors and lenses to function far more efficiently.

More will, no doubt, be heard in the near future of the mercury-vapour lamps in which ultra-violet rays by exciting luminescent powders on the glass are converted to visible light, increasing the red component of the whole. Among other research activities demonstrated was the effect on fittings of temperature (determined by thermo-couples and potentiometers to avoid errors due to resistance effects), which is being studied in one of the small laboratories, where an industrial "Osira" lamp with built-in choke coil was under experimental observation. At the rear of the laboratories an outdoor rack is provided for proving the weatherproof qualities of lanterns; artificial rain equivalent to 40-in. per hr. can be provided. An electrically operated wind-indicator for aerodromes was also undergoing test; the smoke is produced from oil vaporised by an electric hot plate.

An experimental road, 1,200 ft. long, has been fitted up with sixteen posts on alternate sides spaced at 150 ft. One of its two sections, 30 ft. in width, runs between high factory buildings and has a surface of bituminous compound; the other, which is 24 ft. wide, has a concrete surface and is flanked by a grassy bank and open field. Each post on the narrower section stands back 2 ft. from the kerb and carries an 8-ft. bracket arm from which are suspended three lanterns at a height of 25 ft., thus permitting kerb mounting or an overhang of 3 or 6 ft. On one side of the wider section the length of the bracket arm is 13 ft. and the front is 1 ft. from the kerb in order to avoid abrupt alteration in the distance between the sources when the full length of road is used.



Left: General view of the new illumination extensions to the G.E.C. Research Laboratories. Right: A device for taking road brightness readings

Six centrally controlled circuits are in use, each serving eight staggered lanterns; five are wired permanently with different types of lanterns, the sixth being free for experimental units. Span wires have been put up between the posts to provide for central suspension or non-standard spacings for low wattage or cut-off units. On the occasion of our visit suspensions were obtainable between 500-W "Osram" lamps in "Oxford" lanterns, 400-W "Osira" lamps in "Di-fractor" lanterns, horizontally-burning deflector-less "Osira" lamps in centrally suspended cut-off fittings spaced at 90 ft. and 400-W "Osira" luminescent powder lamps, giving much improved colour rendering. A combination of concentrating prisms and diffusing plates in the optical system of the lanterns in the last case enabled the light from the powder-coated bulb to be redirected into the street as well as that from the arc itself, which was visible through discontinuities in the coating.

Electricity Supply Prospects *(Concluded from previous page)*

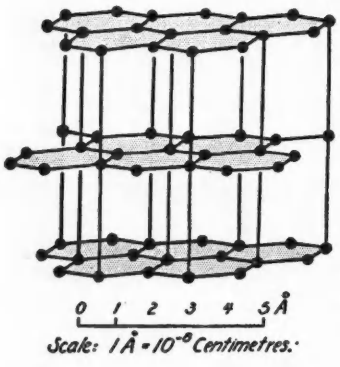
Comparing the number of fatal electrical accidents in Great Britain in the last five years, the president showed that the mean rate of increase was greater in domestic than in factory premises. Factory installations were subject to Home Office regulations, whereas domestic premises were not. Several branches of the electrical industry, on the suggestion of the Association of Supervising Electrical Engineers, were now trying to formulate means by which contractors and operatives should be registered, and, to be so, must possess a required standard of knowledge and craftmanship. They also proposed to make compliance with the present voluntary wiring rules and regulations compulsory, and to see that only fittings and apparatus of defined standards of quality were permitted to be used. That development, which was primarily to safeguard the user and to make electricity more popular, deserved encouragement.

Colloidal Graphite

Its production and employment

THE atomic structure of graphite is believed to account for its "metallic" properties. The atoms are arranged in hexagons which, although they lie parallel to one another in sheets, do not lie perpendicularly over one another. Graphite is opaque, dark grey and in certain forms exhibits a slight lustre. Examination shows that its component particles are plate-like in shape. The ability to split up in this way when rubbed is due to its atomic structure which also accounts for its electrical conductivity.

Messrs. E. G. Acheson, Ltd., claim that it is due to Acheson's discovery of a method of colloidalising pure electric-furnace graphite that the product is so widely used to-day in the electrical industry. "Colloidal" means a state of subdivision of the graphite where the particles, when dispersed in, say, water are separately indistinguishable. The significance of this fineness is seen by using a conductive film of graphite on a non-conducting base, as in the manufacture of resistance elements. Being flat and microscopically small the particles are able to lie on one another like well-laid tiles, so that the maximum contact is made between adjoining particles and the minimum electrical resistance is offered.



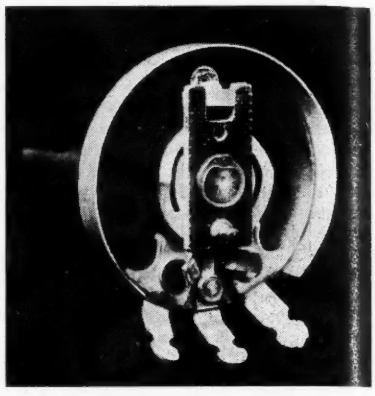
Atomic structure of graphite

The relatively coarse particles of ordinary powdered graphite find difficulty in lying together homogeneously, and so provide higher electrical resistance and also internal arcing in the coating. In audio-frequency circuits this arcing gives rise to a crackling noise and is a reason why colloidal graphite has replaced ordinary graphite in such work.

Another attribute of particle fineness is the greater adhesion of the coatings. The finer in textuure they are the more readily do they key to the surface on which they lie. Graphite colloidalised by this process known as "Aquadag," Messrs. Acheson state, can pass through the pores of a filter paper when dispersed in a fluid.

Church and Daynes have investigated graphite films for the Institution of the Rubber Industry and found that they can be formed on hard and soft rubbers, and on ebonite, and provide a superior contact to mercury. By varying the thickness of the films they could obtain resistivities from 3,000 ohms per cm. square for a coating to about 10^{12} ohms for a film so thin as to be invisible to the naked eye. Rubbing a coating of 3,000 ohms resistance brought about a reduction to 2,000 ohms due to the improvement in orientation of the particles.

Graphite films or coatings are inert and form clearly marked boundaries when used as electrodes. They do not rub off easily from their base, the particles of which, by virtue of their extreme fineness, make intimate contact. The structure of very thin graphite films has been investigated by Professor G. I. Finch, of Imperial College, London, using an electron diffraction camera. The tile-like arrangement of the particles has been clearly shown, while J. J. Trillat, of Besancon, has also confirmed this work using X-ray diffraction.



Ferranti variable resistance, the resistance element of which is an "Aquadag" coating

Ferranti, Ltd., coat the internal walls of the envelope of a cathode-ray tube by means of "Aquadag." This provides a second anode, and being of a black matt texture eliminates internal reflection of light. The result is an image on the fluorescent screen which has very high definition. The same concern makes a variable resistance element of an "Aquadag" coating. The accuracy with which the coating can be varied in thickness enables the resistance to be given good characteristics.

Fixed resistance of the grid-leak type can be made by brushing a small porcelain or glass rod with a dispersion of colloidal graphite in water, and after drying off the moisture, sealing the rod into a tube. Coating the grids of valves with graphite reduces secondary emission and enables the valve to work nearer its maximum without undue overheating. Valve electrodes are deoxidised by heating in a vacuum. The graphite is then applied by means of a spray gun or other convenient methods. By further heating to about 600 or 700 deg. C. the coating is "fixed."

In the manufacture of selenium cells electrodes of colloidal graphite do not form selenides and vitiate the characteristics of the cell. Large insulators have been coated on the underside to discourage corona at transmission at high voltage, and have been observed to have a longer life. One of the numerous other applications of colloidal graphite is as a lubricant (in oil) for the selector equipment in automatic telephone exchanges, electric meters and automatic devices.

Lloyd's Register of Shipping

THE report of Lloyd's operations for the year ended June 30th, 1937, shows that during the year under review plans were approved for 654 ships of 2,216,295 tons gross, more than half of which are to be built in Great Britain. This is the highest figure for many years past. Turbo-electric vessels now number forty-two (483,150 tons) and Diesel-electric vessels number sixty-two—an increase of five (129,237 tons). Diesel-electric equipment is at present being built by the English Electric Co., Ltd., under the Society's inspection, for the *Patricia*, a vessel of 1,150 tons under construction by Smith's Dock Co., Ltd., Middlesbrough, for the Corporation of Trinity House. The twin screw drive will have two 755-b.h.p. engines and the main propulsion generators will also be utilised for auxiliary purposes.

The increased use of electric welding in ship construction continues, and there are few new ships in which welding is not employed to a greater or less extent. In passenger and cargo ships it is extensively employed in parts of the vessel which are not of primary structural importance, but its most important application is to the building of tankers, a type of ship for which this method of construction is especially suitable. A number of large oil-carrying vessels have been completed in which the whole of the transverse and longitudinal bulkheads, including the attachment to the hull, are welded; and in two tankers at present being built, each about 500 ft. in length, the hulls of the vessels are being entirely welded to the exclusion of riveting.

In the United States, also, attention has been particularly directed to methods of automatic welding by machinery instead of by hand. An outstanding example is a tanker, 521 ft. in length, in which the entire structure in way of the oil tanks is being welded by an automatic process, which has been approved by the Committee in this instance. Dr. James Montgomerie, the Society's chief ship surveyor, is at present on a visit to America in connection with this and other developments which are taking place.

Applications for the examination and testing of electrodes continue to be received, and the Committee's list of approved electrodes now contains the names of 152 patterns, of which 103 have been approved as complying with the special requirements for use in parts of primary importance in the structure of a vessel. All these electrodes are subjected to an annual examination and test to ensure that the quality is being maintained.

Progress has also been made in the application of welding to engine structures and pressure vessels. Regulations dealing with welded pressure vessels intended for land purposes have now been published, and the Committee has under consideration the issue of similar requirements for pressure vessels to be used in marine service.

Meetings and Discussions

The subject of the paper read before the I.E.E. last evening—traffic lights—is one of general interest, and the author, Mr. F. G. Tyack, described the latest developments. At the Irish Centre of the Institution last week Lt.-Col. K. E. Edgeworth, this session's chairman, spoke of the possibilities of employing Irish peat for power production. The power companies' views regarding the proposed reorganisation of electricity distribution were put forward to the West Riding District Councils Association by Mr. W. B. Woodhouse last week

Automatic Traffic Signals

CURRENT practice in automatic street traffic signalling is described in some detail in a paper by Mr. F. G. Tyack (Siemens and General Electric Railway Signal Co., Ltd.) which was read before the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 4th. The author deals more particularly with the "Autoflex" vehicle-actuated system, from both the traffic and electrical aspects. He discusses the interlinking of numbers of intersections and includes details of the performances of certain road schemes.

The British standard arrangement is outlined, simplification having followed the laying down by the Ministry of Transport of a definite order of three-aspect colour-light indication of right of way. Mr. Tyack declares that the initial and maintenance costs of lamphouse posts are lower than those of centrally suspended overhead signals, which are less easily seen at close quarters and distract drivers' attention from the road.

The avoidance of "phantom," meaning the illuminated appearance of an unlighted signal due to reflection of sunlight, motor car headlights, &c., is achieved by the use of uniformly refracting lenses, instead of parabolic mirrors, sometimes combined with louvres to prevent the entry of external light from above the horizontal. A standard scheme of signalling for pedestrians has been evolved to avoid misinterpretation by vehicle drivers. Standardisation of descriptive terminology has become essential and certain definitions are suggested by the author.

The basic principles of vehicle actuation are outlined and the latest electro-pneumatic road detector is described, together with overhead and conduit tramway detectors. The timing circuits consist of condensers charged or discharged through high-value resistances, in association with neon tubes which "strike" when ionised at a critical voltage (250, 170 and 147 V), so passing sufficient current to operate relays. The average duration of the impulse is 80 milliseconds. The high-speed relay which is used to repeat the vehicle impulses has remarkably small operating and releasing times—of the order of 0.5 milliseconds.

The controllers resemble automatic telephone exchange equipment and are likewise built up on the demountable unit principle on open iron framework within a pillar. The whole of the switching is effected by relays, apart from which all the apparatus is purely static.

In d.c. areas operating power is obtained from a dynamotor, consisting of three armature windings and commutators on one shaft. In a.c. areas a "transrector" is used, consisting of a transformer with rectifiers and condensers. All relays are of the Post Office type, but insulated for 1,000 V test and an arc-quenching condenser-impedance arrangement enables relays to control the signal lamps.

A number of differing types of controller have now been in operation for long enough periods to enable the author to indicate the principal conditions for which each is considered to be best suited.

Irish Peat

THE manufacture and use of peat fuel was the subject chosen by Lieut.-Col. K. E. Edgeworth for his address as chairman of the Irish Centre of the INSTITUTION OF ELECTRICAL ENGINEERS at Dublin on October 28th.

Col. Edgeworth said that the Irish Free State imported about 2.5 million tons of coal per annum, of which 33,000 tons was used for producing electricity. If some of the fuel requirements could be satisfied by local production the economic position of the country would be materially strengthened.

Compared with coal, the advantages of peat fuel were that it did not melt when heated, and could therefore be used in cases in which coke and anthracite were used at present. It kept alight better than most other fuels and was practically smokeless.

Traffic Light Developments
Power from Peat
Large-scale Distribution

But its calorific value was low; for a given quantity of heat produced, the cost of labour and transport would be increased. For equal calorific value machine peat was four times as bulky as coal, and hand-cut peat five or six times, involving larger apparatus and increasing the cost of transport. Peat was often friable and the proportion of moisture might amount to 45 per cent.

Taking coal as being worth 42s. per ton in Dublin and 52s. per ton in the country, the corresponding values of peat would be, with 15 per cent. moisture, 28s. and 35s. The cost of coal at the docks was 23s. per ton, so that the cost of transport, storage and distribution in Dublin was 19s. per ton. There was no *prima facie* reason why peat should be cheaper to distribute than coal.

The consumption of electric power in the Irish Free State had doubled in the last six years. It was over 280 million kWh for 1936-37 and was increasing at the rate of 40 million kWh, or 14 per cent. per annum. Additional generating capacity would have to be provided in the not very distant future. A system based mainly on water power would be adversely affected in exceptionally dry seasons, and if based mainly on air dried peat would be adversely affected in very wet years. The two systems were, in fact, complementary.

If peat containing 35 per cent. moisture could be produced for 8s. or 10s. a ton, there were no technical reasons why this fuel should not be used for generating electric power.

Col. Edgeworth outlined the processes employed by the Turf Development Board at Turraun to produce dredge-cut, macerated and air dried blocks. It was hoped to commence production at Clonsast bog near Portarlington in two years' time, but both enterprises had been hampered by labour troubles. At Lullymore, in Kildare, the Peat Fuel Co. had received some Government assistance, the object being to produce briquettes containing about 10 per cent. moisture instead of 35 per cent. blocks, by grinding, screening, heat drying and pressing.

The whole business, which embraced methods of use and of manufacture, questions of marketing and the organisation of research, was still associated with a number of unsolved and partially solved problems, and a liberal endowment of research was the only means by which progress could be assured.

At the same time, if the attack were pursued with sufficient determination and in the proper scientific spirit, it did not seem to be too much to say that this great national problem appeared to be within measurable distance of solution.

Unification of Supply

HOW proposed legislation for the reorganisation of electricity distribution was based on a new view of the position of local authorities in this matter was explained by Mr. W. B. Woodhouse (Yorkshire Electric Power Co.) in an address to the WEST RIDING DISTRICT COUNCILS ASSOCIATION on October 27th.

He recalled that the Electricity (Supply) Act, 1926, provided that company undertakings supplying the domestic needs in the areas of two or more local authorities should not be purchasable by the individual local authorities. Since the companies had thus been secured from piecemeal disintegration, their output had grown remarkably. To-day they supplied over 40 per cent. of the national needs at an average price of less than seven-tenths of a penny per kWh, and they had taken the most active part in developing rural areas.

The Yorkshire E.P. Co. transmitted electricity over an area of 2,300 sq. miles. Its rural schemes included 781 sq. miles, comprising 170 parishes in north Lincolnshire and the adjoining parts of Yorkshire. A further scheme in Cumberland, where the Electrical Distribution of Yorkshire, Ltd., was supplying an area of 863 sq. miles, was a practical example of the benefits of unification, because the Penrith Urban District Council agreed that the supply of electricity in Penrith, which was formerly operated as a separate concern, might be carried on by the same organisation. The result was that the average price in Penrith had been reduced by half and the number of customers increased by 81 per cent.

The change of view about the participation of local authorities expressed in the 1926 Act did not attract general attention until the McGowan Committee's recommendations were made. That Committee's objects must command support, the only difference of opinion being as to the best way of attaining them.

Mr. Woodhouse said he was satisfied that the McGowan

Committee's conclusions were right. He knew the local pride in a successful trading undertaking and understood the reluctance to make a change. But he suggested that the attainment of the object was more important than the means to that end; and it might be emphasised that the local authorities' function of representing and protecting public interests was not necessarily exercised in the best way by engaging in the management of a trading concern. When a public body was free from bias it was able to exercise the right to criticise and advise without fear or favour.

Proposed changes, if efficient, should be considered impartially and need not be revolutionary. The McGowan Committee had not taken an extreme view; it recommended, in effect, the continued operation of large undertakings, both company and municipal, subject to such control as might be necessary to assure the desired results. The speaker's own view was that the benefit of local interest should be preserved, that the tendency to centralise control in an ever-growing bureaucracy in London should be resisted and that private enterprise, properly regulated in the public interest, should be encouraged because it preserved incentive and subjected every development to the practical test of "does it pay?"

If the recommendations of the McGowan Committee were followed, then, in Mr. Woodhouse's view, there should be no difficulty in securing by agreement with the companies that those districts which to-day, due to their circumstances, were being supplied more cheaply than others, should not be subjected to increases of price when their undertakings were unified; nor in giving them the assurance of a due participation in the future and growing benefits arising from unification; while the whole unified area would share in the benefits of the greater facilities and lower prices to an extent that could not be obtained in any other way.

Reflectors for Miners' Lamps

A PAPER submitted at a Nottingham meeting on October 20th of the MIDLAND COUNTIES INSTITUTION OF ENGINEERS contains the results of investigations made by Prof. W. H. McMillan and Mr. S. Holmes into means of improving the illumination obtainable from miners' portable electric hand lamps.

The authors' conclusions are that the best reflectors are those which may be fitted inside the well glass of the lamp; and that the best reflecting surface is a covering of matt white photometric paint.

The standard of illumination may be greatly improved by the use of high efficiency bulbs (*i.e.*, higher temperature filaments), especially in combination with a paint reflector. An opal well-glass will reduce "discomfort" glare (largely psychological). Tinted bulbs and glasses seem to effect very little improvement. If a coloured glass is preferred, yellow prismatic glass with a similar paint reflector may be used.

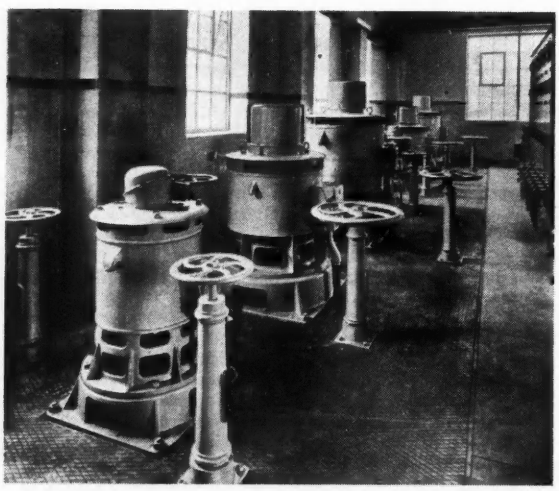
Glare is inevitable to a certain extent, however, because of the poor reflective factor of underground surfaces. Although the illumination may be relatively small, it is always large by comparison with the background brightness. Therefore contrast is very marked and "disability" glare (*i.e.*, reduction of ability to see) is considerable, since it depends on contrast between intensity of light source and the brightness of surroundings. The two glare effects are entirely independent, though they are often present together.

Control of Costs.—The first informal meeting of the session of the INSTITUTION OF ELECTRICAL ENGINEERS was held in London on October 25th, when the president, Sir George Lee (engineer-in-chief, G.P.O.) opened a discussion on "The Control of Costs in an Operating Organisation" by describing the system employed in the Engineering Department of the G.P.O. Sir George exhibited numerous charts and pillar-graphs to illustrate the thorough accounting exercised by this public service. Many of the statistics showed that seasonal variations affected operations, but it was evident that the principles employed were of great importance to supply authorities who had comparable problems. The cost of costing, though considerable in a large organisation with extensive operations, was said to be essential and unavoidable, but the money spent was negligible in view of the enormous savings effected by having the knowledge of exactly how the expenditure was incurred. A speaker said that men often shrank from what they deemed the non-productive cost of analysing their operations, but electrical engineering in particular was based upon costing and there were a variety of instruments to measure speeds, pressures and numerous happenings.

Sewage Pumping at Southampton

THE municipal sewage-disposal scheme which was put into service last week at Southampton embodies automatic pumping plant.

The electrical gear, pump heads and control gear are situated in an upper chamber directly above the pumps in the lower chamber. Seven vertical-spindle "Non-Clogg" pumps are installed for operating against a manometric head of 40 ft.



General view of the motors driving sewage pumps

when handling sewage of a specific gravity of 1.1. Three 34-h.p. 10/10-in. pumps are each capable of delivering 1,700 gal. per min. and, owing to the configuration of the "Non-Clogg" impeller, of passing spheres 5 in. in diameter. Two 95-h.p. 18/18-in. pumps will each deal with 5,000 gal. per min. and 10-in. spheres, and two 190-h.p. 24/24-in. pumps with 10,000 gal. per min. and 12-in. spheres. Each pump is directly coupled to a vertical-spindle slip-ring standard protected motor with totally enclosed slip-ring covers.

All the machines are float-operated, the 34-h.p., 95-h.p. and 190-h.p. pumps being brought into service successively at sump levels of 8 ft. 6 in. and 4 ft. 6 in. below datum, and at datum level; each pump automatically shuts down its smaller predecessor. In view of wide variations in the pumping load, particularly when the plant has to handle storm water, the connections from the float switches are brought to the motor starting panels through a plug board. This enables the attendant to select the combination of pumps best suited to the prevailing conditions.

Float-switch control can be transferred by change-over switches to emergency control by means of "stop" and "start" push buttons mounted on the starting cubicles. In emergency, local push-buttons will stop the motors irrespective of whether float-switch or push-button control is in service.

Each motor is provided with its own starting panel, which includes a main air-break isolating switch, a triple-pole stator contactor fitted with magnetic blow-outs, overload relays and rotor contactors. The rotor contactors are controlled by a clockwork timing mechanism for starting the motors in the minimum time compatible with safety. Pilot lamps give indication of the pumps in service.

The starting panels are enclosed in sheet-steel cubicles with glazed doors arranged to form two self-contained switchboards, on top of which are mounted the ammeters and the air-cooled starting resistances. By interlocking arrangements, access to any starting panel is prevented unless the main isolating switch is open. For controlling the 440-V three-phase supply, a standard three-unit oil-immersed industrial switchboard is installed. That for the incoming supply is of the 1,000-A draw-out type and is provided with under-voltage and overload relays and an ammeter; the other units, each rated at 500 A, control the two feeders to the motor panels and are fitted with overload relays only.

The complete pumping scheme was carried out by Lee, Howl & Co., Ltd., to the instructions of Mr. S. G. Stanton, borough engineer and surveyor to Southampton Corporation, while the electrical pumping equipment was manufactured and supplied by the General Electric Co., Ltd.

E.I.B.A. (Nottingham Branch)

The Nottingham Branch of the Electrical Industries Benevolent Association is holding its annual supper and dance at the Palais de Danse on January 14th. Tickets (12s. 6d. each) can be obtained from the secretary, 1, King John's Chambers, Bridlesmith Gate, Nottingham.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Inductor Speedometers for London Tubes

I have read with interest the article appearing on page 598 of your issue of October 29th. A few years ago my firm had a similar problem: no means could be found to provide a drive for a small electrical generator for supplying current to an electrical r.p.m. indicator on the dashboard, and we solved the problem in a similar manner to that described in the article. A small permanent magnet was fitted with soft iron poles and a piece of notched iron was attached to the revolving member and rotated between the poles, varying the magnetic induction in the air gap. Actually the extended poles had two paths, the flux dividing between the two; when the inductor entered one of the air gaps the flux was increased in that gap and diverted from the other. This method causes less disturbances to the field of the permanent magnet and reduces the tendency to demagnetising. Means for setting the indicator was provided by varying the "shunting" air gap.

While I agree with the writer of the article that an inductor generator of this type is largely independent of such variables as the position of the rotating poles, I do not agree that it is independent of the state of the generator magnets. It is essentially a voltmeter method, the voltage varying with the strength of the magnet and the speed of rotation of the armature, the frequency of the pulsations is incidental.

To make such an instrument independent of voltage, and a "frequency method" in the true sense, would require a frequency meter for the indicator, not a rectified voltmeter.

Broadheath, nr. Manchester, J. W. RECORD.
November 1st. (Record Elecl. Co., Ltd.).

Fuel Purchase

Some change in the methods of fuel selection and purchase for generating stations is long overdue. Individual purchase on a competitive basis should give place to centralised buying by an authority responsible for obtaining all fuel required for the generation of electricity. I suggest that the Electricity Commission should be the purchasing authority and the existing Coal Board the authority with whom all contracts should be made.

Area electricity supply boards would make it their business to know what classes of fuel best suited the stations in their districts and the amount required over a period of years; the local selling boards would know what class and quantity of coal would be available.

These bodies would pass on such information to the Commissioners, who would enter into contracts for anything up to twenty years which would enable colliery owners to lower their prices by shillings per ton, not pence. The Commissioners might purchase at the pit head, rather than "on site," doing all their own transporting (the present charges for which are excessive), or, alternatively, they could place the contract for transport with the railway companies or colliery agents.

When an undertaking had been allotted its fuel, the operatives should be allowed to burn it in such a manner as to produce low fuel costs with reasonable efficiency. If an area manager was not satisfied that the best was being got out of the fuel he should be capable of showing the undertaking's engineers how it ought to be burned, and must be prepared to take over any boiler house for a trial period. Success would depend very largely on the closest co-operation between undertakings, boards and Commissioners; each must employ good well-paid combustion engineers, who would insist on having capable well-paid firemen.

Broadly speaking, some such organisation as follows would be called for in the initial stages. The Electricity Commissioners would retain a chief generating engineer and the Central Electricity Board would have a generating engineer with an assistant with a combustion bias. Each area electricity board would have its own generating, combustion and efficiency engineers, a "colliery" engineer (to keep in touch with markets), and chemists. The Commission's chief generating engineer would be guided by a consultative committee composed of one member in each case representing the Central Board, each area board, the undertakings in each area, central Coal Selling Board, each area Coal Selling Board, colliery agents in each area, colliery owners, Miners' Federation, and colliery sales managers.

These generating and combustion engineers must be experienced and practical power-station men, not merely technicians; they must know coal, be able to find it, supervise a laboratory and apply analyses, &c., know how to buy coal and other fuels, and realise that what is wanted is low fuel costs per kWh generated, not necessarily high efficiencies. They must also be sufficiently alive to the advance of science and forget what they did perhaps many years ago.

Under some such method of fuel purchase and allocation the average coal figures for the country should drop to 0.1d. per kWh, *i.e.*, to about 1.25 lb. per kWh with fuel at about 15s. per ton. A useful guide when purchasing coal is to take $\frac{7}{8} \times \frac{\text{B.th.u. per lb.}}{1{,}000}$ as the price in shillings per ton as received. Later, the multiplying factor, $\frac{7}{8}$, would probably be reduced to unity, giving a cost figure of one shilling per ton for every thousand B.th.u. per lb., *i.e.*, 10s. a ton for a coal with a calorific value of 10,000 B.th.u. per lb., at which I have been able to secure low fuel costs at a base-coal station.

By correctly blending and "marrying" suitable bituminous coals, anthracite and coke breeze, and burning them under proper conditions, there is no reason why fuel should not be purchased on 10 to 20 years' contracts on these terms. Such a mixture can be burned efficiently without the emission of smoke or grit.

"Cheap" fuel is the first essential; that of suitability second. Combustion efficiencies come third, since they are important only in so far as they affect cost.

Sutton Coldfield, *October 28th.* D. SHIPTON WOOD.

A Curious Fault

A short while ago I was wiring some power plugs in a small block of offices. These offices, which were matchboarded throughout and highly varnished, were wired for lighting with a completely bonded lead-sheathed system run on the surface of the matchboard. While working near the meter I received a powerful shock between the lead sheathing of the cable and the supply authority's cut-out box.

Tests on the lighting installation with a "Megger" showed insulation resistances of 14 megohms between metal and lead sheath and 50 megohms between outer and sheath. I found, however, that the earth connection to a water pipe was broken. Upon reconnecting it I obtained a large spark, which reoccurred (but in a less pronounced manner) each time the earth wire was touched on the waterpipe. A small neon pea-lamp tester when connected to sheath and earth lit up momentarily, but a metal-filament lamp did not do so, neither did the meter move.

This is the first case of its kind I have met and I should be glad to have the views of your readers on the matter.

Portsmouth, *November 1st.* ERIC S. WEEKS.

Earth Leakage Trips

In his letter in your issue of October 15th Mr. Gilbert justifies the operation of a trip coil at 65V where the resistivity of the soil is high. By implication, therefore, he confirms that where the soil resistivity is high, cattle are not killed by such a voltage in Germany.

In this case, does he admit that his statement that "a sustained voltage of 30 is certainly to be avoided, especially where animals are concerned," is not of general application, but where soil resistivity is low? H. G. TAYLOR.

London, W.C.2, *October 23rd.*

Permanent Magnets

As large manufacturers of permanent magnets, we must protest against the inference to be drawn from the wording of the review in your issue of October 22nd of a new type of non-magnetic snap switch.

A correctly designed permanent magnet in a good grade of steel does not suffer from appreciable demagnetisation due to either ageing, heating, hammer action or neighbouring electric fields. The circumstances under which the permanent magnet has to work are taken into account in choosing the dimensions and material for its construction, and there is no more reason to expect demagnetisation in a well-designed permanent magnet used in conjunction with the normal type of thermostat switch than there is in the permanent magnets used in accurately calibrated measuring instruments in which the calibration depends entirely on the stability of the magnet.

We are not qualified to discuss the relative merits of various types of switches, but we have supplied many thousands of magnets for use in thermostat devices which, judging by absence of complaints, have not suffered from the defects mentioned in your review.

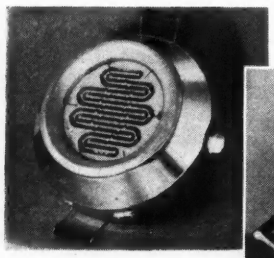
Sheffield, *October 28th.* DARWINS, LTD.,
J. E. GOULD, *Sales Manager, Magnet Dept.*

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Table Cooker-Radiator

The "560" table cooker just introduced by the LONDON ALUMINIUM CO., LTD., Westwood Road, Witton, Birmingham, is provided with specially shaped insulated legs enabling it to be used equally effectively in a vertical position as a radiator. It has a chromium-plated aluminium body of a pleasing modern design, and to ensure maximum efficiency three utensils (kettle, saucepan and frying-pan) are available with specially shaped bases to fit closely into the concave top. A three-heat switch controls the 1,500-W tubular embedded type element. Two handles facilitate carrying, and finishes available are chromium plate or gold or turquoise anachrome.



A table cooker tilted for use as a radiator

A High-voltage Valve Holder

A high-voltage valve holder that is being introduced by Belling & Lee, Ltd., for television work was briefly described in our issue of October 29th (p. 604). We are informed by the makers that tests are being carried out in their own and other laboratories in relation to the corona round the sockets that has been observed in the dark to occur at 11 kV under certain adverse conditions. While no flash-over has been experienced, there is a possible risk that corona might after a period lead to tracking and breakdown of the bakelite and also to damage of the rubber in the set by ozone. They therefore advise designers to carry out thorough tests before using this valve holder in 11-kV positions in their sets.

New Crabtree Accessories

A greatly extended selection of "Lincoln" flush switch assemblies is announced by J. A. CRABTREE & CO., LTD., Lincoln Works, Walsall. The range now includes suitable iron box units for both round and oval conduit, carefully designed in order that wall excavation need be only of plaster depth. The range has also been extended to include two-gang assemblies with all types of box.

There is offered a completely new range of standard 5-A flush assemblies with plain "Jacelite" plates. These are available up to four-gang units for places where a shockproof flush plate is required without surface decoration. In the standard assembly the component switches are fixed by rings, but the plate can also be supplied drilled for the attachment of standard Crabtree flush sockets and switch-base-type bell pushes.

The extensive range of "Compact" flush switch-sockets has been developed to include boxes with adjustable fixing pillars, while among the new sockets offered there are two- and three-pin flanged sockets in 2-, 5- and 15-A ratings, now available with rectangular "Jacelite" flanges with corner fixing holes.

A further addition to the range is to be found in the lampholder section, where "Jacelite" moulded holders (cord grip, batten and switch types, with and without Home Office skirts) are now offered in two basic patterns, the ordinary two-slot type for standard lamps, and a three-slot type for mercury-discharge lamps.

The range of ironclad and multi-gang surface units has been considerably extended. Semi-recessed 5-A units are now available up to 25-gang and 15-A units up to four-gang. In the protected range the maximum sizes are 25-gang and 12-gang respectively.

Polarity Identity Discs

The polarity identity discs of CRITCHLEY BROS., LTD., Brimscombe, Stroud, Glos., are designed for nailing direct on to wooden service boards. They are made of tough, non-hygroscopic, non-inflammable material, and are stocked in black, white, red, blue, green and yellow, other colours being available to order. The fixing nails are supplied with the discs, which are packed in boxes of 250, 500 and 1,000 of one colour, the box being the same colour as the contents, or in boxes of assorted colours. The discs are printed to customers' requirements.

Improved Electric Washer

The new model 221 electric washer of APEX-VACTRIC, LTD., Waterloo Road, Cricklewood, London, N.W.10, replaces models 215 and 216. It has a combined spin rinse and spin dry basket. By means of this equipment the clothes can be washed, rinsed, sterilised, blued and damp-dried without being touched by hand.

The capacity is 14 gal., and a special quick draining bottom is fitted. White enamel is the finish of the tub, and the controls are of aluminium. A dome-shaped cover is provided and the ¼-h.p. heavy-duty motor is of the splash-proof type. The agitator is of cast aluminium with 12-in. high blades.

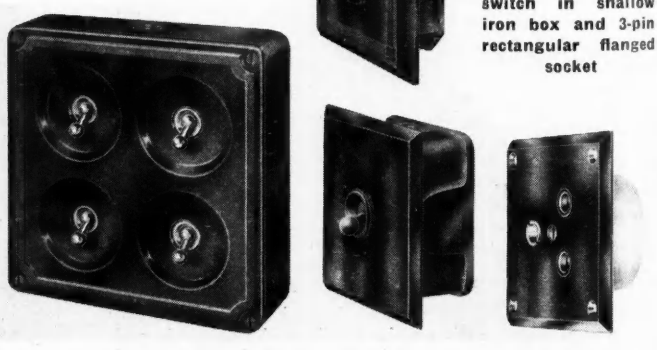
The spin dryer has its own cover which cannot be opened while the basket is revolving. The dryer basket is removable and will dry a tubful of clothes in two minutes without interfering with washing a second tubful simultaneously. During the rinsing process the soapy water is automatically pumped back into the tub. While the wash is spin-dried the water is emptied into the sink.

The chassis is electrically welded, and the frame is fitted with 2-in. rubber castors and waterproof flex with a rubber plug.

The new Apex-Vactric washer

Neon Letter Signs

We have received from the SILVAGREY ELECTRIC, LTD., High Street, Dorking, details of an exterior interchangeable neon letter sign, which, it is suggested, may be used by electricity supply undertakings for advertising slogans. Each individual letter consists of a 15-m.m. clear glass neon tube giving an intense red glow. Each letter is 8 in. wide and 14 in. high, there being in addition a base 4 in. deep which is concealed from view. The voltage required for a neon tube depends on the length of tube between the two electrodes. In an advertising sign incorporating interchangeable letters the length of tube varies in accordance with the characteristics of the letters and, in consequence, the voltage required at one time to spell one particular word differs from the voltage required at another time to spell a different word. Each "Silvagrey" tubular letter is filled with neon gas at a pressure such that each letter requires the same voltage.



Top: "Lincoln" assembly in oval conduit box. Bottom (left to right): 4-gang iron-clad protected unit, "Jacelite" plate flush-switch in shallow iron box and 3-pin rectangular flanged socket

Scandinavian Overseas Electrical Trade

JUDGING by trade statistics for the first half of the current year the Scandinavian markets for electrical goods are improving. Norwegian and Swedish imports have risen by 30 per cent. or more as compared with the first half of 1936, and even import-restricted Denmark has bought 17 per cent. more electrical machinery and appliances abroad. Finland has increased its imports by well over 100 per cent.

Norwegian Imports

The total value of electrical goods imported into Norway during the first six months of 1937 was £736,400, as against £565,650 up to the end of June last year. The following table shows the value of certain imported goods :—

	Jan.–June.	
	1936.	1937.
Motors and generators	£75,750	£113,100
Transformers	12,000	16,700
Heavy switchgear	19,000	30,000
Household switchgear	12,500	19,500
Radio apparatus	51,700	90,750

Under another heading imports in quantities only are given and these include the following :—

	Jan.–June.	
	1936.	1937.
	Metric tons.	Metric tons.
Bulb sockets	101	152
Heaters, irons, etc.	38	105
Telephone and telegraph equipment	75	109
Cables and wire	1,031	797
Dry-cells and accumulators	368	514

Swedish Imports and Exports

Sweden provides a good market for foreign electrical goods, but exports more than it imports. Imports during the first half of the current year amounted in value to £762,500, or £150,000 more than in the corresponding period of last year, while exports aggregated £974,750, an increase of £187,500. An analysis is as follows :—

	Imports. Jan.–June.		Exports. Jan.–June.	
	1936.	1937.	1936.	1937.
Generators, motors, convertors	£196,700	£194,250	£287,200	£366,200
Fans, vacuum cleaners	72,800	103,500	155,600	292,200
Stators, rotors	14,900	20,800	89,800	27,150
Accumulators	15,700	22,350	21,950	37,150
Radio apparatus	198,200	259,350	7,900	11,850
Telephone and telegraph apparatus	—	—	162,850	183,350
Other electrical apparatus	113,850	162,250	61,950	56,650

Imports reckoned in quantities reveal an increase of 67 per cent. in cables, 40 per cent. in carbons, 37 per cent. in insulated wire, and 30 per cent. in switchgear. Slight increases are also recorded for dry cells and lamps, while imports of pocket lamps and insulators diminished. Exports of switchgear were augmented by 42 per cent. and shipments of heavy cables rose by 75 per cent. The following comparative table gives details of the trade by weight :—

	Imports. Jan.–June.		Exports. Jan.–June.	
	1936.	1937.	1936.	1937.
	Metric tons.	Metric tons.	Metric tons.	Metric tons.
Dry-cells	177	217	—	—
Lamps	16	28	22	25
Pocket lamps	140	108	—	—
Carbons	1,816	2,512	—	—
Switchgear	685	890	472	670
Porcelain insulators	318	310	—	—
Heavy cables	1,465	2,409	806	1,410
Insulated wire	409	558	—	—

Danish Imports and Exports

Denmark has increased its imports by 17 per cent. and its exports by 15 per cent. in quantity, the latter being chiefly due to the success of the refrigerator manufacturing industry. Details are given in the following table :—

	Imports. Jan.–June.		Exports. Jan.–June.	
	1936.	1937.	1936.	1937.
	Metric tons.	Metric tons.	Metric tons.	Metric tons.
Generators and motors	226	234	475	626
Heavy cables	13	57	—	—
Insulated wire	215	248	—	—
Installation articles	181	204	133	124
Electrical equipment for motor cars	30	38	—	—
Incandescent lamps	33	40	—	—
Refrigerators	—	—	655	711
Dry-cells and accumulators	36	38	—	—
Radio materials and sets	67	96	—	—
Other elect. apparatus	150	135	—	—

Finnish Imports

The electrical import trade of Finland showed an aggregate value of £392,650 as compared with £195,450 in the first half of last year. The biggest increase occurred in electrical machinery, *viz.*, 120 per cent. Cable and wire imports increased 110 per cent., radio valves 85 per cent., dry cells, incandescent lamps and radio sets each 60 per cent., and accumulators 50 per cent. The value of imports for the first half of the current year and 1936 is shown below :—

	Jan.–June.	
	1936.	1937.
Electrical machinery	£92,150	£210,800
Accumulators	10,700	15,150
Dry-cells	6,550	10,300
Cables and wire	35,400	74,500
Lamps	7,900	12,800
Radio apparatus	35,700	55,800
Radio valves	7,050	13,300

A Slot-meter Handicap. By "Demonstrator"

THE receipt of a quarterly bill means that to most consumers a visit to the local electricity office or showrooms is required to settle the account. Few people pay their bills by post or send their children with the money. Probably over 90 per cent. of the quarterly consumers visit the showrooms four times a year, and the vast majority at least once a year. Slot meter consumers on the other hand have no cause to visit the showrooms unless something goes wrong. They are not then in the right frame of mind to consider buying or hiring additional apparatus. Often their first request is for their existing apparatus to be removed.

Where slot meters are emptied by the borough treasurer's staff as is so often the case in these days of centralisation, it means that many of the consumers never see a member of the Electricity Department from one year to another. Mechanically the consumer places her shillings in the slot, regularly the money is collected, and never does the opportunity arise for any personal contact. This, of course, can be remedied by sending round teams of canvassers, but getting the consumer to visit the showroom voluntarily is infinitely better than trying to persuade her to do so. The average householder receives about three canvassers a day, and does not want to be disturbed from her domestic duties to answer the door any more than is necessary.

It is surprising how many people who enter the showrooms with one object, to pay a bill, linger on the way out to look at displays of various apparatus. They would not come into the showroom to have a look round, but once they are inside, they can see all the latest developments. Much additional business is done by purely casual visits of this nature. People see cookers, water-heaters and refrigerators in actual use, and they are attracted by such small apparatus as irons on display. This is particularly so when demonstrations are held in the same showroom as that in which the accounts are paid. The attendance is always greater at cookery demonstrations at the time when the quarterly accounts are sent out. Consumers kill two birds with one stone.

The slot meter has been a great boon to those people who could never save up the money to settle a quarterly account. But too often the virtues of the prepayment meter are explained to people who can obviously afford quarterly settlement. It would be a great advantage if the showroom staff were instructed that where possible a quarterly meter should be installed, and that slot meters should be provided only in cases of inability to save the money.

Engineers who doubt the wisdom of this proposal should compare the activity at the showrooms when no accounts are being paid with the times when they are crowded with consumers paying bills.

New Standards in France

The Union des Syndicats de l'Electricité, of Paris, has recently appointed a special committee to draw up a series of standard regulations for the construction of mercury rectifiers, and also a committee to draft a series of standards for domestic electrical appliances, including cookers, water heaters and vacuum cleaners.

In the Courts

Disputed Responsibility for an Accident

In the King's Bench Division on Monday last the case of Gemmel and another against Cooper-Stewart Engineering Co., Ltd. (Industrial Electrical Co., Ltd., third parties) came before Mr. Justice Charles and a common jury. Mr. R. E. Gemmel, aged 19 (suing by his father as next friend), Broxbourne, Herts, sought to recover damages for personal injuries from the Cooper-Stewart Engineering Co. upon the ground that the injuries were caused by the alleged negligence of that company, their servants or agents. The company denied the negligence alleged and liability and brought in the Industrial Electrical Co., Holloway, as third parties for the purpose of being indemnified for any damages and costs which might be awarded against them.

It appeared that the plaintiff was an unindentured apprentice of the third parties, and on April 1st, 1936, that company was engaged in removing certain apparatus from the Cooper-Stewart Co.'s premises at Hendon. The plaintiff, in the course of his employment, was engaged in disconnecting wires connected with certain drilling machines preparatory to their removal. The plaintiff's case was that before handling the wires he removed the fuses in order to make the wires dead, but, unknown to plaintiff, in his short absence some servant or agent of the defendants replaced the fuses and consequently plaintiff received a severe electric shock, the live wire penetrating his right thumb with the result that he sustained deep-seated sepsis and infection of the arm for which he claimed compensation.

The defendant company denied that the plaintiff removed the fuses as alleged by him and that such fuses were replaced by any servant or agent of the company, and they denied negligence. They further said that if the plaintiff was injured in the way he alleged it was caused by his own negligence in (a) failing to remove the fuse or fuses before disconnecting the wires; and (b) if he removed the fuse or fuses, in failing to take adequate or proper steps to prevent their being replaced. Further, the defendants pleaded that the work undertaken by the plaintiff was work where technical knowledge or experience was required in order to avoid danger and that the plaintiff acted in breach of the Electricity Regulations. Alternatively, the defendants said that the accident complained of was occasioned by reason of the third parties, the employers of the plaintiff, employing him for work in breach of the Regulations. While denying liability, defendants pleaded that in the event of its being held that they were liable in damages to the plaintiff they were entitled to be indemnified by the third parties.

The third parties denied liability or that they had been guilty of any breach of statutory duty or negligence. They also alleged that the defendants had failed to appoint an authorised person to ensure that the work was carried out by a competent person over 21 years of age acting under the supervision of such authorised person and failed to ensure that the plaintiff did not work unaccompanied.

The plaintiff gave evidence in support of his case, and the hearing was adjourned.

On Tuesday the plaintiff gave evidence that in consequence of the accident he had lost the use of the fingers of his right hand. After the accident he remained at work from April 1st to the 11th. He aimed at being an electrical engineer, and was still studying for his exams. He was not left-handed for writing, but he was in games. The shifting of the machine from one factory to the other was done by the defendants' own men. The current at the time of the accident was at 240 V. He maintained that as a result of the accident his professional career had been definitely injured.

Mr. J. F. Gemmell, the plaintiff's father, said that as an electrical and mechanical engineer he would not say that the work which his son did required any technical skill. Cross-examined by Mr. Flowers, who asked him why on April 17th he wrote to his son's employers stating that a live wire went into his "son's forearm," the witness replied that at that time he did not take particular notice of what had happened. Cross-examined by Mr. Hallett, he said it was true as stated in the statement of claim that his son after the accident was in hospital for seventeen weeks in grave danger of his life.

Mr. W. E. Lawton gave evidence that in his opinion Mr. Gemmell, junior, was in the circumstances under the Electricity Regulations an "authorised person," and competent to carry out the work as only practical knowledge was needed.

Medical evidence was given as to the nature of the injuries which Mr. Gemmell had suffered by reason of the accident, and at the conclusion of the evidence for the plaintiff his Lordship ruled that in his view there was no evidence that anybody in the employ of the defendants interfered with the electrical plant or the electricity supply. In these circumstances he came to the conclusion that the plaintiff had failed to discharge the burden which was upon him to prove that the defendants were liable for what had happened.

Judgment was accordingly entered for the defendant company with costs and for the third parties without costs.

Action Against Supply Company Fails

Judgment was given for the defendants in an action brought last week by Mr. W. A. James to recover damages for personal injuries resulting from the alleged negligence of the London Electric Supply Corporation, Ltd.

The plaintiff contended that owing to the bad condition of the footpath after excavations by the defendant company he slipped after crossing the road and was injured by a passing vehicle, being incapacitated from following his employment.

The defendants maintained that the accident was the fault of the plaintiff who ran in front of a moving vehicle. Mr. Justice Hilbery upheld this contention and, as stated, gave judgment for the company with costs.

Breach of Electricity Regulations

Infringement of the electricity regulations under the Factory and Workshops Act resulted in Webster & Bennett, Ltd., machine tool manufacturers, Coventry, being fined a total of £35 with 28s. costs at Coventry Police Court on October 28th. The company pleaded guilty to three summonses.

Mr. W. F. Findlay, H.M. Inspector of Factories at Coventry, who prosecuted, explained that the first case related to the operation of a switch in the crane trolley conductor circuit in the fitting shop. On August 13th a workman employed by a Leamington firm of contractors was working near overhead crane trolley wires unaware of the fact that the wires were alive. On completing the job he placed a hand on one of the wires in order to pull himself up and received a shock. He then found that he was unable to release his hold, and was obliged to hang from the wire until the power was switched off, when he fell 22 ft. to the ground, receiving burns and lacerations. The second summons was for failing to have a switch in an accessible position in the workshop, and the third was for failing to switch off the current of the trolley conductor wires under similar circumstances on September 3rd, when another man was exposed to the same danger, but was uninjured.

On behalf of the defendants, it was stated that the employés of outside contractors were warned about the danger of the wires. The switch was placed in a safe place so that it could not be interfered with by unauthorised persons.

Parliamentary News (BY OUR SPECIAL REPORTER)

G.P.O. and "Rings"

On November 1st Mr. Graham White asked the Postmaster-General if he would consider the advisability of instituting an inquiry into the operation of price-fixing rings in so far as they concerned prices of supplies to the Post Office. Similar questions were asked by three other members.

Major Tryon said that it had been a matter of common knowledge for some years past that price-fixing rings existed in the case of certain supplies which were in use by the Post Office. The Department had consistently taken every step open to it to ensure that prices were reasonable and had encouraged alternative sources of supply, wherever practicable.

In view of the growth of the Post Office requirements and for the better co-ordination of the Department's investigations, it was felt desirable that contracts relating to such supplies should be brought under special review and he appointed a Standing Committee for that purpose in August, 1936. This Committee was under the chairmanship of the Assistant Postmaster-General and every contract of substance in relation to which effective competition was not forthcoming was referred to it for consideration of the terms proposed before any such contract was placed. The question whether the position of the Department in this connection could be further strengthened had been under consideration from time to time, and in July last the Assistant Postmaster-General invited certain of the manufacturing interests concerned to discuss with him further means to that end. This they willingly consented to do and he awaited the results of the discussion which was about to begin.

Fixed-price Supplies

On October 29th Mr. G. Strauss asked the Minister of Transport whether he could state the number of electricity supply companies in the London area buying electric current in bulk and retailing it to groups of consumers at fixed charges; and whether he could state the annual volume of electricity so retailed.

Mr. Burgin said that so far as he was aware one company only bought electricity in bulk and retailed it to consumers in the London area under the system which the hon. member had in mind. This company was not subject to the provisions applicable to authorised undertakers and official statistics as to the extent of its operations were therefore not available. He understood, however, that the company, which operated in a number of different districts in the London area, purchased upwards of 11 million kWh in 1935 for retail to consumers on the fixed price per light system.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Generating Plant in a London Store

In February of last year Heal & Son, Ltd., put into operation a private generating station, consisting of three separate vertical oil-engine sets, to deal with the daily load, and a small horizontal one for the night load. These were described in our issue of February 7th, 1936. At the termination of the year's running, it was found that the saving effected by the installation of the plant, on the first year's running had been over £600. In calculating this saving, full allowance was made for depreciation of the plant, capital costs, insurance, engineer's wages, fuel, lubrication oil, etc. When the plant was originally installed, the 256 kW available was ample to meet the demand, and allowed for one set to be kept in readiness as a standby. Since this date, the expansion of the firm, and the opening of a new extension in Tottenham Court Road have made it necessary to install further equipment. A further contract was recently placed with Barlow & Young, Ltd., and on the spare bed a new 330-h.p. Ruston cold starting six-cylinder full Diesel engine has been erected, direct coupled to a 220-kW three-wire d.c. generator by the Lancashire Dynamo & Crypto Co., Ltd., working in conjunction with a static balancer which is capable of dealing with a 33⅓ per cent. out of balance current. A space left on the switchboard (Power Equipment Co.) for extensions was filled with new control panels and distribution panels.

The heat from the exhaust of the engines is used for a Ruston-Clarkson boiler, coupled up to the central and domestic hot water systems. The station now consists of one 220 kW vertical six-cylinder full Diesel engine, two 95 kW vertical 5-cylinder Diesel engines, one 56 kW vertical 3-cylinder Diesel engine, and one 10⅓ kW horizontal single-cylinder Diesel engine, all of Ruston's make.

Fraser and Chalmers

With reference to the purchase by Mitchell, Cotts & Co. of the share capital of Fraser & Chalmers (South Africa), Ltd., the General Electric Co., Ltd., points out that the latter company has no connection whatsoever with Fraser & Chalmers of Erith, of which the G.E.C. are the sole proprietors.

An Electrical Display at Bethnal Green

Just over a year ago the Bethnal Green Borough Council assumed the management of its electricity undertaking, taking over the control from the Stepney Council. Since that date various innovations have been introduced by Mr. E. E. Jolly, the borough electrical engineer and manager, with a view to making the borough electrically minded. To celebrate the progress of electric cooking Mr. George Lansbury, M.P., was asked at an exhibition of local industries held by the Chamber of Commerce at York Hall, Old Ford Road, from October 27th to November 3rd, to present the hirer of the one-thousandth cooker with a set of cooking utensils, the 999th and 1,001th hirers receiving electric irons. Many additions to this number are to be expected judging from the interest in the displays on the Electricity Department's stand, which,

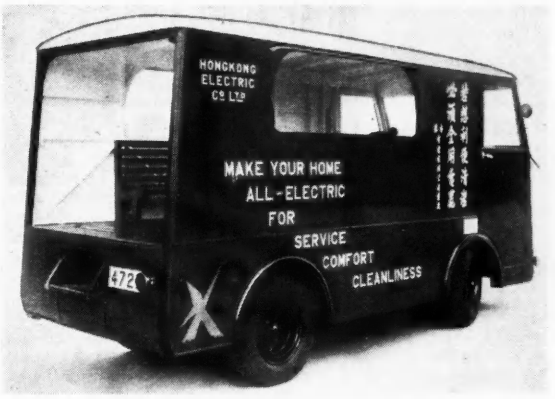
[Elec. Rev. photo.

The Bethnal Green Electricity Department's stand at an exhibition organised by the local Chamber of Commerce.

the largest in the exhibition, had as a special attraction a comparison of the dingy old-fashioned kitchen with an open stove and gas lighting with the spick and span modern kitchen equipped with an electric cooker, water heater, wash boiler and iron. Both on the stand and in the temporary theatre where daily cooking demonstrations were given particular stress was laid on the advantages of radiant type hot plates. The Council did not start the hire of water heaters until the end of August, but already well over two hundred have been installed. To attract attention to this new facility a novel working exhibit showed the use of a "Sadia" heater for filling kettles, cooking, washing and shaving. Since there are considerable numbers of potential small-power users among the cabinet, dressmaking and similar industries in the district, a special feature was made of B.T.H. fractional h.p. motors. The whole of the front of the stand was devoted to a general display of appliances, large lettering reminding visitors that they could "save money by using electricity" and that electricity was "inexpensively efficient." Architectural lamps were used to good effect for decorative purposes.

An Electric Vehicle for China

The accompanying illustration shows a Wilson electric vehicle supplied to the Hong Kong Electric Power Co., for general installation and maintenance work. The extreme heat



A Wilson electric vehicle designed for service in Hong Kong

influenced the design of the body, which is fitted with a window in both sides and a ventilating shutter in the front. The seat is for the use of the electricians.

New E.C.A. Members

At a recent meeting of the E.C.A. Council a number of applications for membership were considered, and the following contractors were admitted to full membership:—

A. M. Halsey (Sadd & Halsey), Nether Street, N.12; A. W. Marsh (A. W. Marsh, Ltd.), East End Lane, N.2; A. E. Sandilands (Sandilands), Stroud Green Road, N.4; A. R. Pank (A. Pank & Son, Ltd.), Norwich; H. Pengilly, Epsom; R. Lear (Lear Bros.), Bath; J. Voaden, Okehampton; J. Whiteside (A. B. Hopkins), Kendal; W. T. Bingham, Woodseats, Sheffield; C. R. Waterhouse, Sheffield; A. E. Youle, Sheffield; G. Hallam, Stockport; Edward Downes, Heaton Moor; and W. Smith (W. Smith (Birstall), Ltd.), Birstall, near Leeds.

The following contractors were admitted to associate membership:—

D. J. Hickmott (Leake & Hickmott), Sidcup; R. L. Mann, Frinton; F. Hope-Johnstone (Torbay Electric, Ltd.), Torquay; H. J. Gornall (H. J. Gornall & Co.), Shrewsbury; and John Gibson, Aspatria.

The Contractors' Year Book

The year book produced by the Electrical Contractors' Association continues to grow; the 1937-38 edition (5s. net or 5s. 6d. post free) is about 30 pages bigger than its immediate predecessor due to the growth in the membership, the inclusion of additional agreements regarding wages and conditions and the reproduction of the Electricity Supply Regulations, 1937. All the useful features of previous year books are retained, making the volume an indispensable adjunct of the contractor's business.

New Zealand Centennial Exhibition

The year 1940 will mark the completion of one hundred years of British Sovereignty and organised settlement in New Zealand, and to celebrate the event it has been decided that an exhibition shall be held in Wellington. The New Zealand Government is lending its support to the project, first by contributing £75,000 to the scheme, and, secondly, by making available the resources of the various Departments of State. The exhibition will be open for the full summer period, *viz.*, November, 1939, to April, 1940. The Wellington City Council has made available for the purpose a suitable site of approxi-

mately 60 acres within easy access of the city. The exhibition is being controlled by a board of directors of representative business men, with the Mayor of Wellington, Mr. T. C. A. Hislop, C.M.G., as chairman. Mr. C. P. Hainsworth, who is well known in Great Britain as an organiser of exhibitions, has been appointed to the position of general manager. For purposes of administration the exhibition is being promoted by the New Zealand Centennial Exhibition Co., Ltd., with a share capital of £225,000. Invitations have been issued to overseas Governments with a view to securing representation. An attractive lay-out has been prepared and special buildings are being erected in which to accommodate exhibits of all classes, the main block of buildings being about 14 acres in extent. It is proposed to cater for all interests. In addition to the exhibits proper (the classification for which will embrace every branch of industry, science and art) it is intended to make provision for an amusement park. Plans and detailed information can be obtained on application to the Exhibition Offices, Brandon House, Featherston Street, Wellington, N.Z.

A part of the electrical exhibition held last week at the Empire Hall, Chesham

I.F.S. Electrical Imports

The upward trend in imports of electrical machinery and goods to the Irish Free State is emphasised in the returns for the January-September period. The value of telegraph and telephone apparatus imported in the first nine months of this year was £73,424, compared with £13,249 in the corresponding period last year. The increase in this case is largely due to the improvements now being carried out in both the internal and cross-Channel communication systems. Imports under the heading "Other electrical goods and apparatus" increased from £208,313 in 1936 to £264,147 this year, and the value of broadcast receivers and component parts and accessories imported also shows an advance over last year. The only notable decrease occurs in the case of electric lamps, which fell from £39,780 in January-September, 1936, to £20,858 in the corresponding period of this year as a result of the protective tariffs imposed by the Government to foster home production.

	Nine Months, January–September, 1936.	1937.
	£	£
Motors	38,717	44,542
Other electrical machinery	167,195	166,568
Dry batteries, complete	11,044	12,146
Dry batteries, parts	3,322	3,169
Electric lamp bulbs	39,780	20,858
Electric lighting accessories, fittings and parts	60,267	58,646
Electric wires and cables, insulated	77,756	69,195
Telegraph and telephone apparatus	13,249	73,424
Broadcast receivers, fully manufactured	64,350	68,874
Radio gramophones, fully manufactured	1,816	1,100
Other radio apparatus, fully or substantially manufactured	5,817	9,112
Component parts and accessories	64,059	80,231
Other electrical goods and apparatus	208,313	264,147
TOTAL	£755,685	£872,012

Electrical Installations in Cinemas

Liverpool cinematograph exhibitors were told by the chairman of the licensing magistrates recently that all electrical work should be done by fully qualified persons. He said that the safety or auxiliary lighting of theatres had been under the observation of the committee, and although in the better-class places the general supervision was good, in a number of cases there were evidences of slackness either through neglect or through failure to appreciate the importance of the matter.

The Institute of Vitreous Enamellers

Correspondence to the general secretary of the Institute of Vitreous Enamellers should now be addressed to 42, Napier Court, Hurlingham, London, S.W.6. The telephone number remains unchanged.

The F.B.I. Business Forecast

The "Business Forecast" published in the F.B.I. "Business Barometer" for the last quarter of 1937 states that the break in the security and commodity markets at the beginning of the second quarter is likely in retrospect to be found to have marked a cyclical culmination. The Government's rearmament, slum clearance and overcrowding programmes may prove to be the first large-scale experiment in this country of the use of public works to sustain industrial activity. Employment and domestic industrial activity continue to be well maintained, and our export trade is fulfilling expectations. The rise in the prices of consumption goods and the recession in the U.S.A., however, are unsettling influences.

An Exhibition at Chesham

The enterprise of two local electrical contractors, Mr. D. L. Chittenden, of Chesham, and Mr. L. C. M. Dent, of Great Missenden, has given residents in the Chesham district an excellent opportunity of seeing the latest developments in domestic electrical and radio equipment. An "Empire Radiolectric Exhibition" was held at the Empire Hall, Chesham, from Wednesday to Saturday last week, when special attractions took the form of cooking demonstrations by the Metropolitan Electric Supply Co., Ltd., television and talking picture shows in a specially constructed theatre seating forty-eight persons, and a free radio set for the holder of a lucky ticket. Apart from the comprehensive displays on the stands of the two organisers, there were separate exhibits of Hotpoint apparatus (with demonstrations of the new washing-up machine); "Exide" and "Drydex" batteries; Westinghouse refrigerators, cleaners, washers, irons, &c. (shown by the Windsor Refrigerator Co.); Callender's cables especially suitable for rural use; Vactric and Apex-Vactric washers, refrigerators and vacuum cleaners; Belling and Ferranti fires; and Philips, Pye, Invicta, Ferranti, Ultra and Marconi radio sets, including a television set by the last-mentioned company showing the working parts. Attention was drawn to the charges for hiring various appliances by a well-arranged "Metesco" display.

Dutch Radio Exports

The value of the exports of radio apparatus from Holland in the nine months ended with September is returned at 36,430,000 fl., as compared with 34,437,000 fl. for the whole of 1936 and 38,324,000 fl. in 1935. The exports of lamps of over 16 V were of the value of 5,466,000 fl., 5,583,000 fl. and 5,875,000 fl. in the three periods, respectively.

Social Events

There was a record attendance at this year's staff dinner of W. T. Henley's Telegraph Works Co., Ltd., and its associates. Dr. Dunsheath, director and chief engineer, presided over a gathering of 650 people at the Great Central Hotel, Marylebone. After the presentation of prizes to holders of programmes bearing certain numbers, the toast of "The Henley Companies" was proposed by Mr. W. C. Gibbs (general manager of the Henley Tyre and Rubber Co.). The speaker made a brief review of the companies' history, and said that the cable company, although the oldest, was the most vigorous member of the family. He hoped that in due course the Tyre Co. would reap the reward of its efforts and become as prosperous as its parent. He congratulated Dr. Dunsheath upon his recent appointment to the boards of the cable and tyre companies. In the course of a response to the toast Dr. Dunsheath said that on attending his first board meeting he had been struck by the number of problems which the directors had to tackle and by the acumen with which they dealt with them. The Henley directors were technical and commercial experts—not just financiers—and they ran the business with full regard to the human factor. In conclusion, the speaker referred to the retirement of Mr. E. J. Pond, the company's Midland District superintendent, who had been with the company for 37 years. The chairman's health was proposed by Mr. D. Ivor Evans (buyer) in a much-appreciated humorous speech, and Dr. Dunsheath replied in like vein. Then Sir Montague Hughman (chairman of the Henley companies) presented the City Livery Club Cup won this year by the Gravesend Works to Mr. E. Judge, manager of those works, and Mr. Judge made a neat speech of thanks. The dinner was over at an early hour, giving the company plenty of time for the dance which followed to the music of the Grosvenor Band.

The Northmet Operatic Society was formed a few months ago. Evidence that the members have put in a good deal of hard work since then was forthcoming at their first production—"The Mikado"—put on for three nights (October 28th-30th) at the Fortune Theatre, Drury Lane. Most of the company bore themselves as well as old stagers and entered fully into the spirit of this familiar work. The cast was as follows:—Mikado, H. Turner; Nanki-Poo, A. Lusha; Ko-Ko, N. Frost; Poo-Bah, G. Wise; Pish-Tush, Stanley Gayer; Yum-Yum, Margaret Gayer; Pitti-Sing, Dorothy Harvey; Peep-Bo, Beatrice Locke; and Katisha, Violet Hedger. Special praise is due to the orchestra, under V. Bartlett, for an admirably sustained performance and our congratulations go to the pro-

ducer, R. Baird. We are looking forward to the Society's next production.

Radio Receiver Production in Canada

Production of radio receiving sets in Canada during the second quarter of 1937 numbered 71,237 sets, valued at $2,616,742 at factory prices. This output represented an increase of 74 per cent. in number and 81 per cent. in value over the corresponding period of a year ago.—*Electrical News and Engineering.*

Hastings Home and Industries Exhibition

Large crowds daily thronged the stands at the Home and Industries Exhibition in which local traders joined forces at the White Rock Pavilion, Hastings, during last week. Stands demonstrating the uses of electrical apparatus were prominent. The Hastings Corporation Electricity Department displayed water heaters and a finely devised replica of a modern kitchen with a constant supply of hot water. Messrs. Wordley, of St. Leonards, exhibited a range of electric hair dryers and clocks, and Southern Thor Services showed electric wringers, washing machines and clothes drying cabinets.

Orders Recently Booked

The Bournemouth Corporation has placed a contract with Siemens Electric Lamps & Supplies, Ltd., for "Sieray" lamps and equipment to light a further 1¾ miles of roads in that town.

The Metropolitan-Vickers Electrical Co., Ltd., which recently received from the South African Government an order for twenty-two 1,200-h.p., 66-ton, 3,000-V electric locomotives, has now received an order from that Government for a further twenty locomotives, the total value of the forty-two locomotives exceeding £500,000. These locomotives are for service on the Natal Railways. They have been made necessary by increased traffic and by extensions of the electrified sections which now total 383 route miles and 634 track miles, the latest extension completing a through connection from Durban to Volksrust, which is approximately 140 miles from Johannesburg. The new locomotives will be similar to 120 "Metrovick" locomotives supplied previously.

Crossley Motors, Ltd., has received orders from the Air Ministry, the War Office and local authorities for oil-engined omnibuses and electric trolley-buses to the value of more than £445,000.

Trade Announcements

Mr. W. R. Cooper, formerly of 64, Queen Street, Redcar, and now of 18, Whitegate Gardens, Harrow Weald, Middlesex, has given up business on his own account.

Eca-Ray Sales, Ltd., has removed to 12a, Bourchier Street, Wardour Street, W.1 (Telephone: Gerrard 3441-2. Telegraphic address: Ecaray, Rath, London).

The Aland Fan Co. is removing its factory and offices, and from Monday next its address will be 50, Clapham Road, S.W.9 (telephone: Reliance 1306. Telegrams: "Ulmine, Clap-road, London").

Claude-General Neon Lights, Ltd., has taken over the neon business at Marshalls Lane, Paisley, of J. Kilpatrick & Son, Ltd. The electrical contracting side of Kilpatrick's is unaffected by this arrangement and will continue to operate as hitherto.

An Advertising Novelty

An interesting novelty just issued by Thorn Electrical Industries, Ltd., takes the form of the "Bob Atlas" miniature dart game. A bull's eye, with rings numbered to varying values, is the target and the dart is propelled by a length of elastic affixed to the card.

The F.B.I. and China

The Federation of British Industries has formed a liaison committee to watch British industrial interests in China. As a result of its last meeting the Committee has written to the Secretary of State for Foreign Affairs expressing the hope that the opportunity will be taken at the forthcoming Brussels Conference of considering, in conjunction with representatives of the other powers concerned, the principles on which claims for compensation for the damage arising from the Sino-Japanese hostilities should be based.

For Sale

West Central Merchandise Mart will sell by auction at Torrens Street, Islington, on November 11th electrical stock and plant.

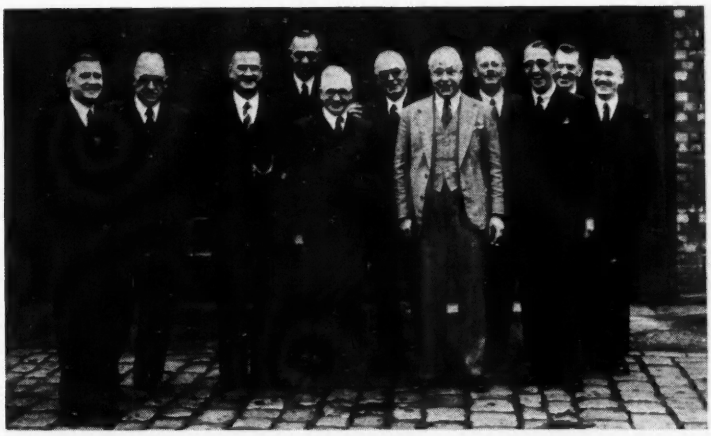
Middleton Electricity Department has for sale surplus plant.

Lane & Girvan, Ltd., invite offers for the purchase of their stock of fitted and partly fitted goods, including cookers and heating appliances.

(See our Classified Advertisements.)

Algerian Electrical Trade

After France and her Colonies, the United Kingdom's trade with Algeria is more than double that of any other country. Mr. G. P. Churchill, lately H.M. Consul-General at Algiers, in his report to the Department of Overseas Trade on the economic and commercial conditions in Algeria, states that among the chief increases in imports from the United Kingdom for 1935, as compared with 1934, were machines (2,244,000 fr.) and metal goods (730,000 fr.). The total value of imports of "electrical machinery," including telephones and wireless apparatus, in 1935 was 35,946,000 fr., while the provisional figure for 1936 is 30,411,000 fr. Imports of electric wire and cable were valued at 11,915,000 fr. in 1935 and 10,767,000 fr. in 1936.



Delegates at a recent sales conference of the Tudor Accumulator Co., Ltd., showing Mr. P. Cattermull, director (light suit), with Mr. W. H. Mort, engineer in charge of traction battery development, on his right, and Mr. F. W. Bissett, works manager, on his left

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. November 3rd.	Fortnight's Inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal)... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£22 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ... ,,	1/8 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£202	£9 dec.
Grade II ... ... ,,	£142	£6 dec.
Grade III... ... ... ,,	£81	£3 dec.
c Brass (rolled metal 2" to 12" basis)... per lb.	8¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	11½d. to 11¾d.	—
c ,, Wire, basis ... ... ,,	8¾d.	—
c Copper Tubes (solid drawn) ... ... ,,	1/1	—
g ,, Bars (best selected) ... per ton	£80	£4 dec.
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£49	—
d ,, ,, Wire Rods ... ... ,,	£54 10s.	—
d ,, ,, H.C. Wire ... per lb.	9¼d.	—
f Ebonite Rod ½" dia. & up ... ... ,,	1/10 to 2/5	—
f ,, Sheet ⅛" thick & up ... ... ,,	1/5 to 1/10	—
n German Silver Wire, Nos. 1 to 12... ,,	2/4	1d. dec.
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	8¼d.	¼d. dec.
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s.	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£23	—
g Lead, English Pig ... ... ,,	£19 5s.	5s. dec.
g Mercury ... ... per bot.	£13	5s. dec.
e Mica (in original cases) small ... per lb.	10d. to 2/–	—
e ,, ,, ,, medium ... ,,	6/- to 12/6	—
e ,, ,, ,, large ... ,,	13/– to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/3¼	—
p ,, ,, drawn bars & rods ,,	1/2	¼d. dec.
p ,, ,, rolled strip & sheet ,,	11¼d.	¼d. dec.
p ,, ,, wire ... ... ,,	1/1¾	¼d. dec.
o Platinum ... ... per oz.	£9 10s.	—
d Silicium Bronze Wire ... ... per lb.	9¼d.	—
g Spelter ... ... per ton	£16 8s. 9d.	5s. dec.
r Steel, Magnet, in bars ... ... per lb.	7½d.	—
g Tin, Block (English) ... ... per ton	£202 5s.	£4 10s. dec.
m ,, Wire, Nos. 1 to 16 ... ... per lb.	4/3	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
m P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Lamp Production in Rumania

The first factory for the production of electric lamps in Rumania has been started at Fieni, near Dimbowitsa. The share capital of 20,000,000 lei has been provided by Bucharest banks and the Dimbowitsa cement works. The output capacity is 6,000 lamps daily.

Advertisement Correction

In the advertisement of the Wardle Engineering Co. in this issue (Supplement p. 54), which went to press early, the date for the coming into force of revised prices is given as October 1st; it should be October 15th.

Hardy Cables

A piece of Henley 3/.029 p. and v.i.r. taped, braided and compounded cable was recently taken by Mr. Payne, of H. T. Hazzledine, Ltd., from the wreck of the s.s. *Hetherfield* (built in 1924) in Brunswick Bay, on the Yorkshire Coast. Since the wreck in January, 1936, the vessel has been gradually broken up by heavy seas and the cable has been under water during every high tide, but examination at Henley's Woolwich Works shows that had it been undisturbed it would have been good for several years' further service. In another recent instance a piece of conduit was taken from a factory installation overseas. Its position was immediately above a vat from which steam and chemical fumes constantly arose and where water with an acid content dripped through the ceiling from the floor above. The v.i.r. cable installed two years ago was in good condition when the corroded conduit was removed, although previously the wiring had to be renewed every three months.

"Transwitch"

In describing Switchgear & Cowan's mobile underground sub-station last week we used the word "transwitch." The Metropolitan-Vickers Electrical Co., Ltd., draws our attention to the fact that this is a registered trade name belonging to that company, and should not be used in connection with other manufacturers' products.

"Punch" Almanack

One of the first reminders of the approach of the Christmas season is the 1938 *Punch* almanack a, copy of which we have just received. The production maintains its usual high standard, and Mr. Punch is again in excellent humour.

A Sales Staff Gathering

On October 23rd, at the conclusion of the Motor Show, Tecalemit officials and sales staff to the number of 100 gathered at the works canteen for the company's eleventh annual sales dinner, and to celebrate the record business done at the exhibition. Following the banquet Mr. R. A. Chalmers, managing director, paid a tribute to the successful efforts made by Tecalemit salesmen not only during the show, but throughout the year. His co-directors, Messrs. E. F. Briggs, S. Gates, W. J. Parslow and A. Sewell, all spoke in support. The guests of the evening were Mr. H. H. Harley, managing director of the Coventry Gauge and Tool Co., Ltd., and Mr. A. Green.

New Catalogues and Lists

C.A.V.-Bosch, Ltd., Acton, London, W.3.—A catalogue of accessories for low-voltage lighting and starting equipment.

London Aluminium Co., Ltd., Adelaide House, London, E.C.4. —A booklet of photogravure illustrations entitled "Aluminium in Architecture and Decoration."

R. Cadisch & Sons, Red Lion Square, London, W.C.1.—A wholesale radio catalogue and a leaflet illustrating "Meteor" anti-dazzle fog lamps.

Switchgear & Cowans, Ltd., Elsinore Road, Old Trafford, Manchester, 16.—An enlarged edition of an illustrated technical booklet describing internal isolation switchgear in detail.

Dorman & Smith, Ltd., Ordsal Electrical Works, Salford, Manchester, 5.—A catalogue of lighting fittings including floodlights, bulkhead and well fittings and handlamps.

Babcock & Wilcox, Ltd., Farringdon Street, London, E.C.4.— The "B. & W. Advertiser" dealing with the company's cranes, tippers, boilers and welding plant in various installations.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—A leaflet describing a de luxe 14-W amplifier.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, London, E.C.4.—A leaflet on selling better light, illustrating the Siemens lightometer, demonstration floor standard and demonstration cabinet; also a list of radio valves.

British Insulated Cables, Ltd., Prescot.—Booklets dealing with switchboard cables and wires, stove and range wire, T.H. type connection wire and asbestos insulated magnet wire.

A. J. Andrews, Gamage Buildings, Holborn, London, E.C.1. —A leaflet dealing with table standards.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.4.—A booklet dealing with industrial drying.

Bankruptcy Proceedings

R. J. Horton, electrical engineer, 204, Coldharbour Lane, Brixton.—The statutory first meeting of creditors was held on November 1st at London Bankruptcy Buildings, under the failure of this debtor, trading as above and also lately at 308, Brighton Road, South Croydon, and 25, Chipstead Valley Road, Coulsdon. Mr. S. W. Hood, Official Receiver, reported that the debtor had handed him a draft statement of affairs showing total liabilities of £3,136, of which £1,841 was expected to rank, against net assets of £434, after payment of the preferential claims. Debtor attributed his failure to losses on hire-purchase agreements, to loss in connection with an agency for a car radio company and bad debts. A resolution was passed for Mr. C. Latham (C. Latham & Co.), 185, High Holborn, W.C., to act as trustee and administer the estate under an order of adjudication in bankruptcy.

E. Mankellow, 2, Holly Cottages, Ascot Place, Ascot, electrician.—This debtor applied for his discharge on October 26th at the Town Hall, Windsor, when it was reported that the receiving order had been made this year. Debtor was involved in a serious motor-cycling accident in May, 1935, which had incapacitated him for a long time. Damages amounting to £976 were awarded him, but the decision was later reversed by the Appeal Court, debtor becoming liable also for the costs of all parties. The Judge expressed sympathy with applicant's misfortune and granted the discharge subject to one month's suspension.

L. C. Rowse, 20, Western Place, Penryn, Cornwall, formerly carrying on business at 60, Lower Market Street, Penryn, Cornwall, radio and electrical engineer.—The public examination took place at the Town Hall, Truro, on October 25th. It was reported that debtor commenced the business in 1932 with his savings of £1,039. He had lost all his original capital and his deficiency was now £557. He attributed his failure to overbuying stock and loss on resale, depreciation of radio sets, losses sustained on hire-purchase transactions and heavy trading expenses.

E. L. Spring, electrical and radio dealer, 61, Dovecot Street, Stockton-on-Tees.—This debtor, who failed in 1932, applied at the Court House, 4, Bridge Road, Stockton-on-Tees, on October 26th for his discharge, which was granted subject to twelve months' suspension. The ranking liabilities were stated to be £534, and a final dividend of 2s. 4d. in the £ had been paid.

J. C. Parnell (Ventnor Wireless Co.), 82, Langdale Road, Hove, lately trading at 150, High Street, Ventnor, I. of W.— Trustee, Mr. A. L. Medcalf, 87, High Street, Portsmouth. Official Receiver, released October 19th.

C. E. Wheat, radio dealer, Haughton, near Stafford, lately trading at 2, Lichfield Road, Stafford.—Trustee, Mr. F. C. Ormrod, 12, Lonsdale Street, Stoke-on-Trent, Official Receiver, released October 17th.

N. R. Neale, radio dealer, 22, Hewlett Road, Cheltenham.— Public examination December 16th at the Court House, Cheltenham.

Nottingham Crystal Twinlight Co., electric lamp dealers, 11, Bilbie Street, Nottingham.—Public examination December 2nd at the County Court House, Nottingham.

J. A. N. B. Tanner, electrical engineer, 3, Jubilee Buildings, Pakefield, Lowestoft.—Receiving order made October 25th on a creditor's petition.

S. Perkins, radio dealer, 1, Lodge Lane, Beeston, Leeds.—Discharge suspended for six months until April 1st, 1938.

R. Corbett and **I. A. J. Merritt** (Corbett & Merritt, electrical and radio engineers, 2b, Junction Road, Andover.— Receiving order made October 28th on debtor's own petition.

R. T. Collins, wireless dealer, 41, Market Street, Penryn, Cornwall.—Trustee, Mr. G. C. Hancock, 12, Princes Street, Truro, Official Receiver, released October 20th.

Company Liquidations

Savoy Refrigerator & Manufacturing Co., Ltd., Devonshire Works, Dukes Avenue, Chiswick, W.4.—At the statutory meeting of creditors the statement of affairs showed ranking liabilities of £11,783 against net assets of £10,772, leaving a deficiency as regarded the creditors of £1,012. The company also held a 100 per cent. interest in the Dulci Electrical Co., Ltd. The liabilities of that concern were £5,310, against net assets of £2,366, leaving a deficiency, so far as the creditors were concerned, of £2,944. It was stated that the Savoy Refrigerator & Manufacturing Co., Ltd., had acted as banker for the electrical company and as agent for all the latter company's sales, which had been invoiced and collected by the parent concern. It was explained that owing to the fact that the two companies had been closely associated and occupied the same premises it was difficult to separate the two concerns. The parent company was registered in January, 1937, with a nominal capital of £5,000, all of which had been issued. The sales of refrigerators had been approximately £6,000. There had been a large expenditure incurred on experimental work in connection with a refrigerator to be sold to the public for about £20. Negotiations had been in progress for the introduction of further capital, but owing to pressing creditors liquidation had to take place. The creditors passed a resolution confirming the voluntary liquidation of the company with Mr. R. T. Tiplady, of Cooper & Cooper, 34, Fenchurch Street, London, E.C., as liquidator, with a committee.

Butcher, Smith & Co., Ltd., electrical dealers, Park Road, Teddington, Middx.—At the meeting of the creditors the statement of affairs showed ranking liabilities of £567. The total assets were £260, leaving a deficiency, as regarded the creditors, of £307. The company apparently ceased trading early in August last. One of the directors stated that the reason for the substantial loss was the practice of certain manufacturers in going direct to the company's customers. Resolutions were passed confirming the voluntary liquidation of the company with Mr. F. E. Bendall, of Bendall, Poppleton & Appleby, 4, Charterhouse Square, London, E.C., as liquidator, with a committee consisting of the representatives of Benjamin Electric, Ltd., Callender's Cable & Construction Co., Ltd., and Philips' Lamps, Ltd.

Rural Electricity Supply Co., Ltd.—Winding up voluntarily. Liquidator, Mr. J. M. Davies, Bush Lane House, Bush Lane, Cannon Street, E.C.4.

Hendersons Wholesale Electrical & Radio, Ltd.—Particulars of claims by November 30th to the liquidator, Mr. A. C. Lucas, Brettenham House, Waterloo Bridge, Strand, W.C.2.

Bishop Radio Stores, Ltd.—Particulars of claims by November 22nd to the liquidator, Mr. W. S. F. Stagg, 128, Romford Road, Stratford, E.15.

Regal Radio Co., Ltd.—Particulars of claims by November 22nd to the liquidator, Mr. W. S. F. Stagg, 128, Romford Road, Stratford, E.15.

Electricity Supply

Lighting, Domestic, Power

Barking.—SPECIAL TARIFF.—A proposal to introduce a tariff which will include the cost of apparatus in the " unit " charge is under consideration.

ELECTRIC-DISCHARGE LIGHTING.—The Highways Committee has directed the borough electrical engineer to prepare a report upon the cost of converting the street lighting in Ripple Road to the electric-discharge system.

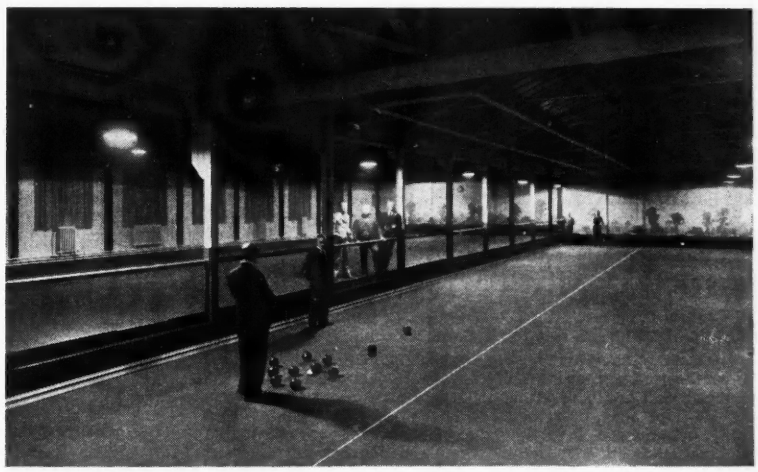
METER TESTING.—Meter-testing equipment is to be purchased at a cost of £700.

Barrow-in-Furness.—LIGHTING.—The Electricity Committee is to provide lighting at Roa Island at a cost of £650.

SUPPLY TO NEWTON.—A supply of electricity is to be provided to Newton, the Dalton Urban District Council having withdrawn its objection to overhead lines.

Blaydon-on-Tyne.—OVERHEAD LINES.—The North-Eastern Electric Supply Co., Ltd., proposes to erect overhead lines at Stella and Back Polmaise Street, Blaydon, and is seeking the approval of the Urban District Council to the plans.

Bridgend.—DISAGREEMENT OVER CHARGES.—With regard to the disagreement of the Bridgend Urban District Council and the Penybont Rural District Council over the charges for electricity supplied in bulk by the former authority to the Kenfig Hill district, the Electricity Commissioners have written expressing regret that the Councils are unable to reach agreement. In order that a settlement may be arrived at the Commissioners offer to arrange a joint meeting of the Councils, to be purely informal and without prejudice to any application which may be made to the Commissioners by either party for a formal determination.



The Richmond (Surrey) indoor bowling green lighted with 300-W Siemens "Sieray-Dual" electric-discharge lamps in dispersive reflectors. The installation was carried out by Locke and Soares, New Cavendish Street, W.1

Brierley Hill.—ELECTRICAL INSTALLATIONS.—The Urban District Council has accepted the quotation of the Midland Electric Corporation for Power Distribution, Ltd., for providing the necessary electrical installations in the 140 houses now in course of erection at Bluck's Lane.

Burnley.—EXTENSION TO WORSTHORNE.—The Town Council has authorised an application for consent to borrow £3,786 for cable, transformers and switchgear for the Worsthorne mains extension.

Chester.—POWER STATION EXTENSIONS.—The Electricity Committee proposes to extend the Queensferry generating station.

Clitheroe.—BETTER LIGHTING.—A system of mercury electric-discharge lighting has been installed in Whalley Road. Twenty-five new standards are equipped with 250-W lamps.

Douglas (I.O.M.).—PROGRESS OF UNDERTAKING.—Besides supplying Douglas and the surrounding villages within an area of approximately 17 sq. miles, the Corporation's Pulrose power station affords a bulk supply to the I.O.M. Electricity Board for distribution over the remainder of the island. The increase of 1.6 million kWh (25 per cent.) in electricity generated during 1936-37 therefore indicates the extent of electrical development in the island as a whole. The report of Mr. B. Kelly, the borough electrical engineer and manager, shows that there was a reduction from 1.09d. to 1.06d. in working costs per kWh sold, despite increased prices of materials. On the latter point, he states that the price of coal delivered at the power station has further increased since March last to £1 6s. 11d. per ton—21 per cent. more than the average paid in 1935-36. The prices of practically all other materials have advanced, and there have been increases in the wages of employés. Difficulty was experienced during the year in obtaining supplies of coal and at times stocks became unduly depleted, but there has since been a considerable amelioration of the position. With regard to development within the Corporation's area, there was a net increase of 455 in the number of consumers, making the total 5,359, of whom upwards of 86 per cent. were domestic. Excluding public lighting and bulk supply, sales (4.7 million kWh) were equivalent to 189 kWh per head of the population, or 880 kWh per consumer. Cookers on hire at March 31st numbered 866 (700 at March 31st, 1936) and water-heaters 232 (80).

Droxford.—RURAL SUPPLIES.—No objection has been raised by the Council to the West Hants Electricity Co.'s proposals for supplying electricity to Spencer Place, Shedfield, and Coombe Place, Meonstoke, subject to certain conditions being complied with. It is considered that underground low-voltage cables should be used by the Mid Southern Utility Co. for supplying Warnsford and West Meon.

Dukinfield.—INSTALLATION OF DOMESTIC APPARATUS.—The Town Council has decided to inform the Stalybridge, Hyde, Mossley and Dukinfield Joint Board that in future electric boilers or other apparatus must not be installed in houses belonging to the Corporation without the Council's consent, and that the cost of removing any gas boiler or other appliance to be replaced, and of re-installing it if the electrical apparatus is removed, shall be chargeable to the Board.

Ealing.—POWER CHARGES.—Following the receipt of an application for electricity for power purposes only, the Electricity Committee has pointed out that the flat rate of 1d. per kWh is only applicable when the supply for lighting the whole of the premises is taken from the Corporation, and that the Council has never adopted a tariff for a power supply. A flat rate of 4d. per kWh is to be charged in all cases where electricity is taken for power purposes only.

Finland.—WATER SHORTAGE.—During the past months there has been an increasing shortage of water, and the situation does not seem to have improved despite ample autumn showers. In Finland's largest water-power station, on the River Imatra, a sixth turbine, designed to increase the output by 22,000 kW, has been completed, but cannot be used as the present water pressure barely suffices to keep the other five turbines running. Rationing arrangements are likely to be instituted.

Guildford.—POWER STATION EXTENSIONS.—An inquiry was held last week by the Electricity Commissioners into the Corporation's application for permission to extend the power station. The case for the Corporation was presented by Mr. S. G. Turner, who estimated a saving of £80,278 over ten years if private generation were continued. Against this the London and Home Counties J.E.A. estimated a saving of £79,050 in six years if a bulk supply were taken. Mr. W. E. Affleck, the borough electrical engineer, pointed out that the nearest generating stations were Battersea, 28 miles to the north, and Brighton or Portsmouth, 40 miles to the south, and that Guildford would make a link between them.

Hastings.—LOAN.—The Electricity Committee is seeking to borrow £10,000 for house services and £30,000 for mains.

Iceland.—HYDRO-ELECTRIC SCHEME.—As announced last week, the first big power station in Iceland is just being put into operation. It is built on the River Sag, which flows from Lake Tingvallatn to the sea. There are four falls closely following one another. The harnessing of the Ljosafoss fall (17 metres) is the first step towards making use of the power resources of the river, estimated at 100,000 h.p. Two sets are being installed for the present, each developing 6,250 h.p. with a 16.6-metre net fall, states a message from *Reuter's Trade Service* at Oslo. Work on the dam has been carried out with a view to the future full exploitation of the fall and provides for the eventual installation of five sets. Power will be conveyed by a cable about 50 km. long leading to a new transformer station near the Ellida-aar power station.

Ilford.—HIRE OF WASH-BOILERS.—The quarterly hire charge for wash-boilers is to be reduced from 4s. to 2s. 6d.

Irish Free State.—HYDRO-ELECTRIC SCHEME.—The contract for the construction of the dam at Poulaphouca, County Wicklow, in connection with the River Liffey hydro-electric scheme has been secured by François-Cementation, of Doncaster. The contract is worth £350,000, and covers the work on the dam, reservoir tunnel and power house, but does not include the diversion of roads, construction of bridges and other incidental work. The contract for the supply of electrical equipment will be allocated during the next few months. The work to be done by François-Cementation represents the greater part of the scheme, which is designed to augment the generation of electricity at the Electricity Supply Board's main station at Ardnacrusha and to provide Dublin with an ample water supply. The allocation of the first contract will probably result in work being started in the near future, and it is hoped to have the scheme completed early in 1940.

Jarrow-on-Tyne.—LIGHTING.—The Town Council is to improve the lighting of Ellison Street, Western Road and Grange Road by the erection of mercury electric-discharge lamps.

Kirkwall.—NEW GENERATING SET.—The Corporation has installed a new 375-h.p. Diesel engine and dynamo at the electricity works.

Lancaster.—SUPPLY TO CONDER VALLEY.—Approval has been given by the Town Council to a £21,000 scheme for providing electricity in the Conder Valley and to a number of outlying parishes. The proposal, which was first mooted a number of years ago, was shelved until sufficient progress had been made with other rural schemes. The Council now has a supply area embracing 200 square miles, only five and a half miles of which is within the city of Lancaster.

London.—BETHNAL GREEN.—The abolition of meter rents after the December accounts will represent a concession of £3,000 a year to consumers.

BATTERSEA.—In a recent review of the progress of the Electricity Department, of which Mr. H. F. J. Thompson is engineer and manager, it is stated that 14,000 appliances of all descriptions are hired out at the present time, an increase of 4,600 during the past two years, or 33 per cent. The Council's scheme for wiring consumers' premises free of initial cost has met with great success and has resulted in 19,000 installations being put in, an increase of 3,700 or 25 per cent. during the past two years. The total capital value of the undertaking is £1,895,616, of which £1,000,494 has been repaid, leaving a balance outstanding of only £895,122, represented by modern and efficient plant installed during recent years. Supply mains have been laid in every street in the borough, and the whole of the public lighting is carried out electrically.

WANDSWORTH.—The application of the Borough Council for sanction to a loan of £14,863 for electrical installations in place of the existing gas lighting in 1,418 dwellings was recently considered by the County Council. The estimate of the cost of the work was based on the accepted tender. This was not the lowest, but the L.C.C. was satisfied with the reason given, and that the amount of the estimate was reasonable.

ELECTRICITY FOR PUMPING.—Particulars of the working of the main drainage service during 1936-37 submitted to the L.C.C. show that the consumption of electricity for pumping was 11.1 million kWh and of gas 5.2 million cu. ft.

Mountain Ash.—CHEAP LIGHTING.—The Council has decided that the lighting flat rate for the quarter shall be 1d. per kWh.

Newcastle-under-Lyme.—SCHEDULES OF CHARGES.—Leaflets have been issued by the Electricity Department giving the reduced charges to different classes of consumers (ELECTRICAL REVIEW, October 15th, page 540). One, for the multi-part tariff, bears a sketch showing the electrical services obtainable at "the flick of a switch." The fixed charges for different types of houses are clearly set out.

Newport (Mon).—POWER STATION EXTENSION.—It is reported that the generating station is to be extended at an estimated cost of £388,000 to meet the load for the winter of 1940. The new plant is to consist of a 30,000-kW turbo-alternator and two 150,000 lb. per hr. boilers, as recommended in a scheme worked out by the borough electrical engineer (Mr. A. Nichols Moore) early this year. The present capacity of the station is 29,000 kW.

New Zealand.—CHRISTCHURCH.—Appreciation of the action of the British Electrical Development Association in making it possible for overseas supply authorities to hire the three films, "The Wizard in the Wall," "Well I Never!" and "Plenty of Time for Play," is recorded by Mr. E. Hitchcock, general manager of the Christchurch Electricity Department, in his report for 1936-37. In all there were twenty-eight showings in the area. Besides film propaganda, the Department persevered with its range sales campaign under which assistance is given in the purchase of equipment. The experiment appears to have demonstrated in some measure that it is not the cost of power but of the appliance that is the chief difficulty with most prospective cooking consumers. During 1936-37 the number of domestic ranges connected to the mains increased by 1,471 to 7,694. Although at present electricity charges are low—last year the average revenue per kWh sold was 0.832d.—concern is felt at the prospects for the future. The past year was the last of the twelve-year bulk supply contract with the Public Works Department, and it is now faced with a 30 per cent. increase. This, or any increase approaching it, says Mr. Hitchcock, definitely means the termination of the period of satisfactory financial results. There is much to be questioned, he considers, in this method of seeking to make the development period in the Dominion electricity supply pay for major works and initial losses. As a method it savours of "Pay while you can't, and cease when you can," he says. Another subject now under discussion is the amalgamation of local bodies. Whatever advantages may be claimed for amalgamation in connection with other civic activities, states the engineer, there can be no question of its wisdom electrically. During the year several conferences have been held with representatives of the Heathcote County Council regarding the possibility of the Department taking over the supply, first in part, and later in the whole of the county area. Statistics given in the report show that sales increased from 63¼ to 70¼ million kWh and new consumers averaged 78 per month.

North Wales.—PROPOSED JOINT AUTHORITY.—Members of the North Wales and South Cheshire Local Authority Electrical Undertakings' Association meeting at Chester last week adopted the following resolution: "That on the assumption that the Government requires large scale electricity amalgamation in implementing the McGowan Report, this meeting recommends the adoption of the scheme proposed." It is proposed to constitute a joint electricity authority for North Wales and South Cheshire, the authority to be based on public ownership and its members to be elected by the local authorities only, and the taking-over of all existing electricity undertakings in the area. Provision is made for an authority of twenty-seven members on the basis of one member for every £150,000 aggregate rateable value, and the setting-up of group committees in Anglesey, Caernarvon, Denbigh, Flint, Merioneth and part of Cardigan, Montgomery and part of Shropshire and Cheshire. The report adds that the estimated cost of acquisition will be in the region of £6,000,000.

Pewsey.—RURAL DEVELOPMENTS.—Replying to a letter from the Rural District Council, the Wessex Electricity Co. has stated that the extension of mains to serve the villages of Rushall, Charlton and Wilsford is under reconsideration in connection with its programme of work to be carried out next year. The Wessex Electricity Co. has also submitted plans for a proposed extension to Collingbourne Ducis and Collingbourne Kingston.

Portsmouth.—CONTRIBUTION TO RATES.—So that the Electricity Committee can make a contribution to relieve the rates without increasing electricity charges the cost of voltage changes this year is to be met by way of a loan instead of being taken from the revenue, as was the case last year.

Scarborough.—METER TESTING.—Equipment costing £1,22[illegible] is to be provided by the Electricity Committee for meter testing.

Southport.—SUB-STATION.—The Electricity Committee is seeking sanction to borrow £12,000 for mains and £2,000 for sub-stations.

South Shields.—ELECTRICAL DEVELOPMENTS.—In connection with its scheme for reorganising the electricity undertaking the Town Council is to proceed with the second year's programme. This includes high power supplies to the sub-station in North Marine Park and the remainder of the existing 110-V area in Ocean Road, and the provision of sub-stations in Baring Street, Chichester Street and Brunswick Street. Tenders are to be obtained for the necessary equipment.

SUPPLY TO TYNE DOCK.—The Town Council has reached an agreement with the Tyne Improvement Commission regarding the supply of electricity to the Tyne Dock.

SUB-STATION.—A sub-station is to be erected in Stanhope Road at a cost of £2,750.

Wallasey.—VEHICLE BATTERY CHARGING.—The tariff for the charging of electric vehicles has been fixed at 0.6d. per kWh. plus 5s. per quarter rental for time-control equipment.

(Continued on next page)

New B.S.S. for Circuit-breakers

COPIES of the revised British Standard Specification for oil switches and circuit-breakers (B.S.S. 116-1937), which was reviewed in these columns last week, are now available from the British Standards Institution. This Specification is published in two parts; the first deals with three-phase oil circuit-breakers with breaking capacities up to 500 MVA, single-phase oil circuit-breakers, oil switches and oil isolating switches, and the second part with three-phase oil circuit-breakers with breaking capacities above 500 MVA. The price of each part is 3s. 9d. post free.

TRANSMUTATION OF MATTER

This apparatus has been erected at the East Pittsburgh research laboratories of the Westinghouse Co. for bombarding atomic nuclei by means of high-speed atomic projectiles. It consists of a pear-shaped tank, 30 ft. in maximum diameter by 47 ft. high, housing a high-voltage generator and a 40-ft. vacuum tube through which the particles are shot. The total height of the structure, including a two-storey building underneath, is 65 ft.

Rubber Conference

A rubber technology conference is to be held in London, at the Hotel Victoria, from May 23rd to 25th, 1938, under the auspices of the Institution of the Rubber Industry, 12, Whitehall, S.W.1. from which further particulars are obtainable.

Weymouth.—EXTENSIONS.—The Electricity Committee is to provide a supply to Winterborne Monkton at a cost of £1,100. Sanction has been obtained to borrow £7,429 for the provision of a supply to East Lulworth.

Wigton.—RURAL SUPPLIES.—In reply to an inquiry, the Mid-Cumberland Electricity Co., Ltd., has informed the Rural District Council that electricity supplies are being provided to Welton, Hesket Newmarket and Caldbeck, and that subsequently plans would be prepared for supplies to other parts of the rural area.

Worthing.—MAINS AND SERVICES.—Sanction is being sought by the Electricity Committee to borrow £50,000 for mains and services and £25,000 for hired apparatus.

Traction

Belgium.—LIGHT RAILWAY ELECTRIFICATION.—The Belgian National Light Railways (the Vicinaux) now has about 800 miles of its system electrified on the 600-V d.c. system with overhead current collection. There are seventy-one sub-stations, of which fifty are entirely automatic and six semi-automatic; the latest installations incorporate rectifiers. The yearly energy consumption is about 73,000,000 kWh.

India.—IMPROVED SERVICE IN MADRAS.—The South Indian Railway's electrified suburban line out of Madras now carries a seven-minute service with 150 trains a day in place of 90 previously. First-class accommodation has been abolished and increased capacity provided in the two lower classes.

Middlesex.—SUBURBAN ELECTRIFICATION.—It was reported to the County Council last week that at a conference of representatives of the Council, the London Passenger Transport Board and the main line railway companies Mr. F. Pick (L.P.T.B.) said that with regard to the suggestion of the Council for the electrification of additional lines, or for the construction of new tube railways, the Board's answer must be that it was unable to contemplate any works other than those included in the present programme. To secure a reasonable return on the capital being expended would require a considerable increase in revenue. In reply to Alderman W. B. Pinching's remark that for many reasons Middlesex urgently needed the electrification of all suburban traffic Mr. Pick said it must not be assumed that because Middlesex was concerned in the major part of the present works nothing further would be undertaken in the county in subsequent programmes.

Newcastle-on-Tyne.—PURCHASING TROLLEY-BUSES.—A protest against the action of the Transport Committee of the City Council in ordering six trolley-buses without giving local firms the opportunity to tender has been made by the Tyneside District of the National Union of Vehicle Builders. In a statement the Union alleges that the Committee has acted in a very high-handed manner. If the vehicles had been ordered locally it would have meant that 75 per cent. of the money would have been kept in the city and would have furthered the prosperity on Tyneside. The Union is taking exception to the Committee ordering the trolley-buses from concerns which already have orders on hand for the Council. By this method, it was explained at a meeting of the City Council, more favourable terms had been obtained.

South Shields.—SUB-STATION.—A sub-station is to be erected in the North Marine Park in connection with the trolley-bus service at an estimated cost of £1,100.

Switzerland.—MORE ELECTRIFICATION.—A provision of 416,700 Swiss fr. is included in the 1938 budget of the Swiss Federal Railways for the electrification on the standard 15-kV system of the branch line from Le Day to Le Pont, close to the French frontier station of Vallorbe. It has also been decided to electrify at the same time the short private railway from Le Pont to Le Brassus.

ELECTRIC TELPHER.—A new electric telpher recently completed between Stockalp and Frutt is stated to be the longest in the country. The difference in altitude between the terminal stations, which are nearly 2¼ miles apart, is 2,709 ft. The service is maintained by two four-seater suspended cars shuttle-working on two 32-mm. carrying cables spaced about 13 ft. apart. The travelling speed of the cars on the telpher is 787 ft. per min.

Communications

Canada.—TELEGRAPH REVENUE.—Gross revenues of all telegraph systems in Canada increased from $9,741,394 in 1935 to $10,378,873 in 1936. Operating expenses advanced from $8,416,329 to $8,710,349 and net revenues from $1,325,065 to $1,668,524.—*Electrical News and Engineering.*

BROADCASTING.—Two 50-kW regional transmitting stations are being put into operation by the Canadian Broadcasting Corporation, learns *Reuter's Trade Service* from Ottawa. One of these is the Quebec station, at Contrecœur-Verchères, which was to be ready for service on November 1st, and the other is the Ontario station, at Hornby, which will be completed by December 1st. Later installations of some importance will be the high-power transmitters for the Maritime Provinces and for the Prairie Provinces, and also the international high-power short-wave system.

Great Britain.—RADIO RELAY.—The Post Office has been investigating the relative merits of different methods of relaying broadcast programmes in connection with the proposal to nationalise the radio relay industry, and technical research has been undertaken under the direction of Mr. T. Walmsley, Ph.D., M.Inst.C.E., A.M.I.E.E., M.I.R.E., who was appointed staff engineer for study and control of line distribution broadcast systems. It is understood, unofficially, that definite conclusions have been reached as to the merits and costs of the different systems, and that the Post Office is now exploring the possibility of opening an experimental relay station in Southampton. It is likely that the system chosen will provide for the relaying of four or more programmes instead of the dual programme at present given under private enterprise. Meanwhile the present insecurity of tenure prohibits extensive development by private companies until a statement from the P.M.G. is forthcoming.

TELEPHONE IMPROVEMENTS IN SCOTLAND.—In connection with the scheme to improve telephone communications between the Orkney Islands and the Scottish mainland the 74-acre summit of Wideford Hill, near Kirkwall, has been purchased by the Postmaster-General, and a radio-telephone station is to be built there.

Forthcoming Events

Institution of Electrical Engineers.—Monday, November 8th. Institution, London, W.C.2. 7 p.m. Informal meeting. Discussion on "Electrode Boilers for Steam Raising." To be opened by Cmmdr. F. J. C. Allen.

Meter and Instrument Section.—Friday, November 5th. Institution, London, W.C.2. 7 p.m. Inaugural address by Mr. H. Cobden Turner, chairman.

North-Eastern Centre.—Friday, November 5th. Grand Assembly Rooms, Newcastle-upon-Tyne. 8 for 8.30 p.m. Annual dance. Monday, November 8th. The Newe House, Newcastle-upon-Tyne. 6.15 p.m. "The Use of Protective Multiple Earthing and Earth-leakage Circuit Breakers in Rural Areas." Mr. H. G. Taylor.

Western Centre.—Monday, November 8th. Merchant Venturers' Technical College, Bristol. 6 p.m. "Modern Factors Affecting Electricity Costs and Charges." Mr. J. A. Sumner.

North Midland Centre.—Tuesday, November 9th. Hotel Metropole, Leeds. 7 p.m. "Modern Systems of Multi-channel Telephony on Cables." Col. A. S. Angwin and Mr. R. A. Mack.

Hampshire Sub-Centre.—Wednesday, November 10th. University College, Southampton. 7.30 p.m. "The Jointing and Terminating of High-voltage Cables." Mr. W. Holttum.

Dundee Sub-Centre.—Thursday, November 11th. University College, Dundee. 7.30 p.m. "Some Examples of Electricity's Contribution to Measurement." Mr. S. H. Hawkins.

Scottish Centre.—Thursday, November 11th. Royal Technical College, Glasgow. 7.30 p.m. Joint meeting with the Institution of Mechanical Engineers. "Hydro-electric Power Stations, with Special Reference to the Galloway District and Swiss Hydro-electric Stations." Mr. F. H. Williams.

Junior Institution of Engineers.—Friday, November 5th. 39, Victoria Street, London, S.W.1. 7.30 p.m. Informal meeting. "Some Factors Governing the Choice of Industrial Drives." Mr. S. Osborne-Shave. Friday, November 12th. 39, Victoria Street, London. 7.30 p.m. Annual general meeting.

Association of Supervising Electrical Engineers.—Monday, November 8th. Royal Hotel, Bristol. 7.15 p.m. "Compulsory Wiring Regulations and Registration." Mr. A. Kirk.

Institute of the Plastics Industry.—Monday, November 8th. British Industries House, London, W.1. 7.30 p.m. "The Application of Some Plastics to the Cable Industry." Mr. C. M. Hamilton.

Institute of Transport.—Monday, November 8th. Institution of Electrical Engineers, London, W.C.2. 5.30 p.m. "Modern Developments in Railway Operating Practice." Mr. V. M. Barrington-Ward.

Illuminating Engineering Society (*Decorative Lighting Section*).—Tuesday, November 9th. Institution of Mechanical Engineers, London, S.W.1. 6.30 p.m. "Lighting at the International Exhibition, Paris." Messrs. J. Courgnon and R. O. Sutherland.

Institute of Marine Engineers.—Tuesday, November 9th. Institute, London, E.C.3. 6 p.m. "Electro-magnetic Slip Couplings for Use with Geared Diesel Engines for Ship Propulsion." Messrs. G. L. E. Metz and N. Ericson.

Institution of Post Office Electrical Engineers.—Tuesday, November 9th. Institution of Electrical Engineers, London, W.C.2. 5.30 p.m. "The Work and Functions of the Efficiency Engineer." Mr. M. G. Holmes.

International Faculty of Sciences.—Wednesday, November 10th. 64, Gt. Cumberland Place, London, W.1. 7.30 p.m. "Power for Social and Industrial Developments in the Future." Mr. F. W. Shilstone.

Royal Society of Arts.—Wednesday, November 10th. John Street, Adelphi, London, W.C.2. 8.15 p.m. "Guglielmo Marconi and the Development of Radio Communication." Sir Ambrose Fleming.

Diesel Engine Users' Association.—Thursday, November 11th. Caxton Hall, London, S.W.1. 5 p.m. "Some Notes on the Performance of Piston Rings in Relation to Medium-speed Diesel Engines." Mr. F. C. Caistor.

Electrical Engineers' Dance.—Friday, November 12th. Grand Hotel, Harrogate.

Midland Electrical Engineers' Ball.—Friday, November 12th. Grand Hotel, Birmingham.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Ardrossan (AYRSHIRE).—November 19th. Town Council. Electric lighting of 100 houses. Joint town clerks, Burgh Chambers (deposit £1 1s.).

Australia.—MELBOURNE.—November 30th. Posts and Telegraphs Department. Outside distributing wire. (T. 27711/37.)*

December 14th. State Electricity Commission of Victoria. 22,000-V, compound-filled, unit type switchgear and accessories. (T.Y. 27686/37.)*

Bedford.—November 15th. Borough Council. Twelve months' supply of meters, cookers and cooker control units, kettles, meter boards and fuses. (October 29th.)

Birkenhead.—November 15th. Corporation. Twelve months' supply of cable, meters and transformer kiosks. (October 29th.)

Bootle.—November 23rd. Watch Committee. Street lighting. (See this issue.)

Bradford.—November 18th. Corporation. Two 7½-ton electrically operated travelling cranes. (See this issue.)

Braintree.—November 10th. R.D.C. Three vertical-spindle automatically controlled crude sewage pumps, with electric motors, at the White Notley sewage pumping station, and two sets at the Cressing station, with all accessories. Financial officer, Council Offices, St. Peter's Close, Bocking, Essex (deposit £3 3s.).

Cardiff.—November 18th. City Council. One 11-panel and one 4-panel 6.6-kV switchboards. (See this issue.)

Chester.—Visiting Committee of the Upton County Mental Hospital. Electrical installation in the nurses' home, including lighting and power services, service cables from existing power house, internal telephones, electric lift, &c. Applications to F. Anstead Browne, county architect, The Castle (deposit £10), by November 10th.

Cleethorpes.—November 15th. Corporation. Three double-deck trolley-buses, with accommodation for fifty-six passengers each. Engineer and manager, Corporation Transport Offices, Pelham Road.

Colwyn Bay.—November 23rd. Electricity Department. E.h.v. and l.v. cables and sub-station equipment. (See this issue.)

Coventry.—Airport Committee. Lighting at the airport, Baginton, including equipment, switchgear and cables. (October 29th.)

Edinburgh.—November 18th. Burgh Council. Coal handling plant for the Portobello generating station. (October 22nd.)

Erith.—November 16th. R.D.C. Electricity Department. One 4-panel and one 5-panel switchboards. (October 29th.)

Essex.—November 26th. General Purposes Committee. Electrical installation at the County Hall, Chelmsford, extensions. (See this issue.)

Exeter.—November 10th. City Council. Overhead cable (1,075 yd. in length) from Countess Wear swing bridge to Double Locks, or, alternatively, the supply and erection of electrical plant at Double Locks Hotel. R. H. Dymond, city engineer, Municipal Offices.

Farnworth.—November 8th. U.D.C. Electricity Department. Wiring cables. (October 29th.)

Fife.—November 8th. County Council. Electric lighting at forty houses at Thornton and forty at Woodside. C. R. Douglas & Son, 15, East Port, Dunfermline (deposit £1 1s.).

Glasgow.—November 16th. Corporation. Electric lighting installation at Woodilee nurses' home extensions. Office of Public Works, City Chambers (Room 81), (deposit £2 2s.).

Great Yarmouth.—December 6th. Borough Council. Switchgear. (See this issue.)

Halifax.—November 11th. Corporation. Six electrically driven centrifugal pumps for the sewage works, Copley and North Dean. C. Lumb, manager, Sewage Department, Salterhebble.

November 11th. Cleansing and Sewage Committee. Various works, including electrical, in connection with buildings, &c., at North Dean and Copley. D. T. Lloyd Jones, borough engineer, Crossley Street (deposit £1 1s.).

Hornsey.—November 16th. Borough Council. One motor-driven mobile tower wagon. (See this issue.)

India.—Bombay, Baroda and Central India Railway Co. November 17th. Electric lamps. (See this issue.)

Iraq.—Modern lighting equipment for the aerodrome at Rutbah, complete with the necessary cables, &c. Royal Iraq Legation, 22, Queen's Gate, London, S.W.7.

Kingston-upon-Thames.—November 15th. Corporation. Street lighting equipment. (October 29th.)

Leicester.—November 6th. City Council. One electrically driven ram pump, capable of delivering screened sewage at rates varying from five to ten million gallons per twenty-four hours against a head of 180 ft., for the Abbey pumping station, and a similar set capable of one-half to one million gallons against a head of 220 ft., for the Belgrave station. City surveyor's Office, Town Hall (deposit £2).

Leyton.—November 10th. Corporation. E.h.v. switchgear. (October 29th.)

London.—BATTERSEA.—November 15th. Borough Council. Coal. (October 29th.)

Manchester.—November 10th. Electricity Committee. Six months' supply of weldless steel lamp columns and fittings. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall.

Middlesex.—December 2nd. County Council. Electrical installation at elementary school. (See this issue.)

Newcastle-upon-Tyne.—November 8th. Transport and Electricity Committee. Cadmium trolley wire and tubular tramway poles. T. P. Easton, general manager, Transport and Electricity Undertaking, Manors (deposit £2 2s. each).

New Zealand.—WELLINGTON.—January 25th. Public Works Department. Three single-phase outdoor lightning arrestors for use on a 50-kV earthed neutral system, with surge counting mechanisms. (T. 27782/37.)*

Northumberland.—County Council. Installation of electricity in the Seaton Valley Astley Central school and the Longbenton Dudley Council school. County architect, County Hall, Newcastle-upon-Tyne.

Nottinghamshire.—November 15th. County Council. Electrical work at a Mental Colony to be erected at Balderton, Newark. (October 29th.)

Plymouth.—November 15th. Corporation. Three-phase meter testing equipment. (October 29th.)

Portsmouth.—November 16th. Electricity Undertaking. E.h.v. and l.v. cables, with the necessary cable racks, &c., for the generating station, Gunwharf Road. (See this issue.)

Reigate.—November 22nd. Borough Council. One 11-kV. three-phase, e.h.v. switchboard and two 300-kVA transformers. (See this issue.)

Rochdale.—November 23rd. Electricity Committee. Twelve months' supply of meters. (October 29th.)

Rowley Regis.—November 18th. Corporation. Electric wiring at 200 houses on the Codsall estate and twenty-six on the Waggon Street estate. (See this issue.)

St. Helens.—November 12th. Borough Council. Salt glazed stoneware ducts and cable protection tiles; also h.v. and l.v. p.i. cables. (October 29th.)

South Africa.—DURBAN.—December 3rd. City Electrical Engineer's Department. 6,600-V switchgear. (T.Y. 27533/37.)*

CAPE TOWN.—November 24th. Electricity Department. Cables. (T.Y. 27790/37.)*

JOHANNESBURG.—December 11th. Electricity Department. H.v. circuit-breakers, with instruments and transformers, relays, control panels, &c. (T.Y. 27733/37.)*

December 16th. Union Tenders and Supplies Board. Batteries. (T. 27802/37.)*

Southend-on-Sea.—December 8th. Borough Council. 250-kVA alternator, motors, switchgear and accessories, at the refuse disposal works. (October 22nd.)

November 22nd. Pumping plant at three stations, comprising nine electrically driven sewage pumps, with discharging capacities from 400 gal. to 3,500 gal. per min., motors, switchgear, piping, &c. J. D. & D. M. Watson, 3, Central Buildings, Westminster, London, S.W.1 (deposit £3 3s.).

Southport.—November 18th. Pier Committee. Three electric train car bodies, and dismantling the existing bodies. Borough Engineer's Office, Town Hall (deposit £1 1s.).

South Shields.—Town Council. Electrical installations in 65[illegible] houses at Horsley Hill. J. Reid, borough engineer.

Stoke-on-Trent.—November 10th. Electrical Engineer's Department. Two 15,000-kVA outdoor-type transformers. (October 22nd.)

Sutherland.—November 16th. County Council. Electrical work at thirty-two houses at Brora. E. W. Brannen, architect. Public Health Office, Dornoch.

Swansea.—November 29th. Borough Council. Meter testing equipment. (October 29th.)

November 29th. 33,000-V oil-filled and compound-filled switch units. (See this issue.)

Uruguay.—MONTEVIDEO.—December 3rd. State Electricity Supply and Telephones Administration. 131,400 metres of single-, two- and three-core l.c. conductors. (T.Y. 20716/37.)*

December 7th. Three automatic voltage regulators and accessories. (T.Y. 20717/37.)*

November 17th. Eight current transformers. (T.Y. 20718/37.)*

November 24th. H.v. armoured cable. (T.Y. 27632/37.)*

December 14th. H. and l.v. armoured cables. (T.Y. 27630/37.)*

West Ham.—November 29th. Borough Council. Twelve months' supply of p.i. cables. (See this issue.)

West Hartlepool.—November 10th. Borough Council. 300-kVA transformer. (October 29th.)

November 18th. Meter testing equipment. (See this issue.)

November 20th. Two 5/7 cwt. electric vehicles. (See this issue.)

West Lothian.—Education Committee. Various works, including electric lighting installation, in connection with additions and alterations at Armadale R.C. school. Applications to E. Blades, director of education, Education Offices, Bathgate, by November 8th.

West Midlands.—November 30th. Joint Electricity Authority. Transformers, and 33,000-V interconnected mains. (See this issue.)

West Riding.—November 8th. County Council. Electric lighting at the extensions to Wickersley Senior Council school. Education officer, County Hall, Wakefield.

November 15th. General Purposes Committee. Electrical work in the laboratory of the County Health Offices., Wood Street, Wakefield. West Riding architect, County Hall, Wakefield.

Weymouth and Melcombe Regis.—November 22nd. Electricity Department. Meter test room equipment. (See this issue.)

Wick.—November 27th. Town Council. Electric lighting at sixty houses. Burgh surveyor (deposit £2 2s.).

* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Aberdeen.—Town Council. Accepted. Electric lighting at forty-four houses on the Powis estate (£274).—Aiken & Smith.

Australia.—MELBOURNE (VICTORIA). — City Council. Accepted. P.i. cables and jointing materials.—Callender's (Noyes Bros., Melbourne); Henley's. V.i.r. cables.—Liverpool Electric Cable Co.; Brooks, Robinson Pty., Ltd.—*Tenders.*

Birmingham.—Education Committee. Accepted. Laying electric cables at Shenley Field Cottage Homes (£118).—H. Pratt, Ltd. Electric lighting installation at new school, Stanville Road, Sheldon (£374).—R. E. Eyre & Sons. Electric lighting installation at Great Charles Street Commercial College extensions (£130).—W. J. Sheath.

Durham.—County Education Committee. Accepted. Electrical installation in schools: Easington Colliery Council (£430).—H. H. Tordoff. Horden Colliery New Council (£370) and Bishop Auckland Girls' County (£60).—R. Robson. Rushyford Council (£76), Seaham Harbour Council (£223), and West Auckland Infants' (£95).—Falconar Cross & Co.

Eccles.—Highways Committee. Accepted. Four centrifugal pumping sets, with motors and switchgear (£1,362).—Blackstone & Co.

Education Committee. Accepted. Call bells and wiring at Winton school.—J. Hunter & Co.

Glasgow.—Cleansing Committee. Accepted. Thirty-three electric traction batteries (£239 each).—Tudor Accumulator Co. Two batteries for testing purposes (£224 each).—Young Accumulator Co.

Public Assistance Committee. Accepted. Cooking equipment for Crookston Home.—Carron Company; Ultra Rapid Engineering Co.

Ilford.—Electricity Committee. Accepted. Rectifier equipment for trolley-bus system (£3,680).—Hewittic Electric Co.

Lanarkshire.—County Council. Accepted. Electric lighting in seventy-eight houses at Overton (£548).—D. Henderson.

London.—L.C.C.—Education Committee. Installation of electricity at the Shirley residential school, Croydon:

	£		£
Read and Partners, Ltd. Accepted	**6,628**	H. J. Cash & Co.	7,655
Archibald Meckhonik	6,804	Pinching and Walton	8,140
T. Clarke & Co.	6,898	Alexander Hawkins & Sons ...	9,200
Holliday & Son (Electrical) ...	6,909	The chief engineer's comparable estimate is £6,900.	
W. J. Furse & Co. (London) ...	7,111		
Duncan Watson (Electrical Eng.)	7,592		

Housing and Public Health Committee.—Installation of electric lighting, &c., in about 715 existing houses at Becontree (Dagenham Area No. 15 contract):

	£		£
Keeble, Ltd. Accepted	**6,453**	Evans and Shea	7,620
Newman and Watson	6,690	Electrical Installations, Ltd. ...	7,783
Ilford Electrical Co.	6,804	Samuel Reed & Sons	8,020
Rylands Electrical Co.	6,886	Pemberton and Sturgess (Great Britain)	8,282
Holliday & Son (Electrical) ...	6,920	J. H. Golding	8,942
G. E. Taylor & Co.	7,583	The chief engineer's comparable estimate is £7,370.	
Ellis and Ward	7,586		
Read and Partners	7,586		
F. H. Wheeler & Co.	7,588		

Accepted. Wiring and fittings for electric lighting &c., in blocks 1, 5 and 8 of dwellings on the Friar estate, Camberwell (£1,860).—W. H. Gaze & Sons. Electrical installation in the remainder of block 14 of dwellings on the Kennington Park estate (£1,358).—Jacob, White & Co. Electrical installation in block 22 of dwellings on the Wandsworth Road site (£1,594).—A. Meckhonick.

Highways Committee. Accepted. Ventilating equipment at Blackwall Tunner.—Keith Blackman, Ltd. (£1,194); James Howden (Land), Ltd. (£3,756).

POPLAR.—Contracts Committee. Recommended. Motors and starters in connection with the change-over (£1,249).—Higgs Motors, Ltd.

STEPNEY.—Electricity Supply Committee. Recommended. D.c. domestic water heaters (£3 14s. each) and a.c. domestic water heaters (£3 6s. 6d. each).—Santon, Ltd. Sub-contractors in connection with the contracts with (a) the General Electric Co., Ltd., for the supply of turbo-alternator, &c.; and (b) International Combustion, Ltd., for the supply of steam-raising plant, &c. (a) Turbo-alternator: Condensers, with auxiliaries.—Worthington-Simpson, Ltd. Water tanks.—Braithwaite & Co. Condenser tubes.—Barronia Metals, Ltd. Condenser tube plates.—I.C.I., Ltd. Boiler feed pumps.—Mather & Platt, Ltd. H.p. steam valves.—Hopkinsons, Ltd. L.p. steam and water valves.—J. Blakeborough & Sons. Condensate meter.—G. Kent, Ltd. (b) Steam-raising plant: Boiler pressure parts, drums, casings, structures, &c., and piping and de-superheater.—Stirling Boiler Co. Superheater control.—Superheater Co. Valves and fittings.—Babcock & Wilcox; J. Blakeborough & Sons. "Igenia" water regulators.—J. Gordon & Co. Feed regulators.—Copes Regulators, Ltd. Economisers.—Senior Economisers. Ltd. Motors and control gear.—Met.-Vick. Elecl. Co.; G. Ellison, Ltd. Instruments.—A. West & Partners. Draught fans and dust collectors.—J. Howden & Co. Soot blowers.—Ivor Power Specialty Co.

Middlesex.—Health Committee. Accepted. Installation of lifts at Chase Farm Institution (£1,049) and the Central Hospital (£830).—Glasgow Engineering Co. Wireless installation at Edgbury Homes: Wiring (£102).—Grensells. Equipment (£59).—Philips Lamps, Ltd. Electric generators for Central Hospital (£750).—Electric Construction Co. Electrical installations at the Redhill Hospital (£324) and at the Western Hospital (£634).—Colston Electrical Co.

Recommended. Electrical installations at the Redhill dispensary (£169).—Colston Electrical Co.

Salford.—Light, Heat and Power Committee. Accepted. Twelve months' supply of three-phase oil-immersed power transformers.—Met.-Vick. Elecl. Co.

Purchasing Committee. Accepted. P.i., flexible, and motor vehicle cables for twelve months.—Hackbridge Cable Co.; Wholesale Fittings Co.; Ward & Goldstone; Falk, Stadelmann Co.

South Shields.—Town Council. Accepted. Sub-station equipment.—Hewittic Electric Co. Switchgear.—A. Reyrolle & Co.

Notes

Faraday House Old Students' Dinner

The twenty-ninth annual dinner of Faraday House Old Students' Association was held on October 29th with this year's president, Mr. C. H. P. Ewbank (chief engineer, Edmundson's Electricity Corporation) in the chair. In proposing the toast of the Association Capt. J. M. Donaldson referred to the "partial" retirement of Dr. Alexander Russell from the post of principal of Faraday House (he is now "advisory principal") and welcomed his successor, Dr. W. R. C. Coode-Adams. Dr. Russell, in response, said that in two years' time Faraday House would attain its fiftieth birthday. He welcomed the election of the Earl of Rothes (a former president of the Association) as chairman of the governors. Dr. Coode-Adams, who also responded, referred to the continued growth of the college since its foundation in 1889, when Dr. Russell had had seven pupils, to the present term when the fifty-six entrants were the most in its history. Of eight students attempting the final D.Sc. in the last examination, all had passed, five with honours. Since the last dinner 147 students had received appointments. Proposing the health of "The Guests," Mr. H. W. Swann (Senior Electrical Inspector of Factories) said that among those present were eleven past presidents of the I.E.E. (two old Faradians) in addition to other leading figures in the electrical world. Brief replies were made by Mr. S. B. Donkin (pres. Inst.C.E.) and Sir Cyril Hurcomb (Electricity Commissioner). The health of "The Chairman" was proposed by Mr. Johnstone Wright (chief engineer, C.E.B.), and Major C. E. Prince said a few words expressing the feelings of all past and present students in regard to Dr. Russell.

E.P.E.A. Dinner

At the 15th annual dinner of the West Yorkshire Section of the Electrical Power Engineers' Association on October 29th, at Leeds, Mr. J. C. Welburn, Section chairman, presiding, the toast of "The Association" was proposed by Mr. Arthur Greenwood, M.P. He congratulated the Association on its professional spirit which had led to its complete recognition and a higher status for its members. What was good enough for doctors and lawyers (who had the greatest trade unions in this country) was good enough for engineers, who, he trusted, would always be mindful of the rights of the consumer. He had found a remarkable unanimity in disagreement with the proposals of the McGowan Committee, and he hoped the rather short-sighted and ill-considered recommendations of its report would receive more thought before they were put into effect. A test on scientific lines would, he believed, show that there were large undertakings in this country which were no more efficient than some of the smaller ones.

The President of the Association (Mr. H. J. Cox), responding, assured Mr. Greenwood that anything the Association did to secure better salaries and conditions would take proper cognisance of the position of the consumer. He suggested that the N.J.B. should have been the authority asked to prepare the report on distribution. Undertakings would never get the load they sought until they could sell electricity at a price at which the public could afford to waste it. Mr. C. I. Shuttleworth (deputy city electrical engineer, Hull) proposed the health of the ladies and guests, to which Alderman J. H. Waddington (Halifax) responded.

R.N.D. Signals Dinner

The nineteenth annual dinner of the R.N.D. Signal Company will be held on November 13th at Pritchard's Restaurant, 79, Oxford Street (Tottenham Court Road Tube), at 6.30 p.m. for 7 p.m. Tickets (6s. 6d.) can be obtained from the hon. sec., Mr. T. N. Riley, St. Vincent, The Avenue, Radlett.

The Illuminating Engineering Society

To afford opportunities for the discussion of the artistic side of lighting the Illuminating Engineering Society has formed a new section dealing with decorative lighting. An attractive programme has been arranged for the present session which opens on November 9th (Institution of Mechnical Engineers, Storey's Gate, Westminster, 6.30 p.m.), with addresses on the "Lighting of the International Exhibition in Paris," by M. J. Dourgnon and Mr. R. O. Sutherland, A.R.I.B.A. Further particulars can be obtained from the hon. secretary, Mr. D. W. Durrant, Magnet House, Kingsway, W.C.2.

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

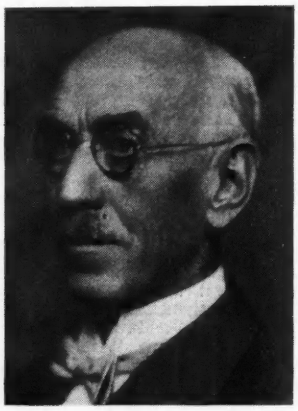
BROADUIT copper tubes and fittings.
TOWNSEND electrolytic cell for producing chlorine gas.
MARCO bowl fires.
EPIC iron.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. W. T. Hodgson, M.I.E.E., an assistant engineer in the chief engineer's department of the L.C.C., is retiring this month on attaining the age of sixty-five. Mr. Hodgson entered the service of the L.C.C. in 1899, and since 1921 he has been second officer in charge of the electrical division of the chief engineer's department. He has been closely associated with the installation of electric lighting and power in the Council's housing estates, schools, main drainage stations, &c., and has for many years been responsible for negotiations with electricity supply companies for the supply of electricity to the Council. To fill the vacancy caused by the retirement of Mr. Hodgson, the Establishment Committee proposes that **Mr. A. H. Sears,** M.I.E.E., an assistant engineer, be placed upon the higher scale of salary, commencing at £950 and rising to £1,000.

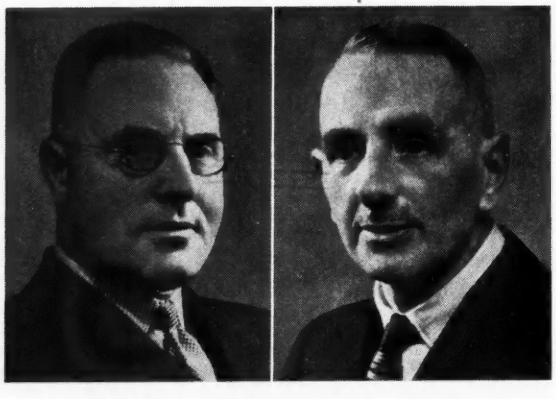


[Elliott & Fry.
Mr. W. T. Hodgson

Mr. H. R. Forbes Mackay, general manager of the Lydney County Council electricity undertaking, has been presented with the Peter Nicol Russell Memorial Medal by the Institution of Engineers, Australia. This is the highest honour which the Institution bestows upon engineers and is awarded annually to a member who has made a notable contribution to the science and practice of engineering in Australia.

Mr. W. Weekes, whose retirement from the position of borough electrical engineer at Shoreditch was referred to in our last issue, will receive a grant of £2,219 and an allowance at the rate of £682 per annum due to him under the Superannuation Acts. The Council is to present him with a testimonial and has decided to engage him as consultant borough electrical engineer for six months at a fee of £300.

Mr. G. A. Pope, deputy managing director of W. Canning & Co., Ltd., has been appointed joint managing director with Mr. E. R. Canning, the present managing director, and **Mr. F. H. Ewens,** the secretary, has been elected a director. Mr. Pope has been connected with the business for forty years and has been a director since the formation of the company in 1920. Mr. Ewens, who has been associated with the business for thirty years, has been secretary since 1924.



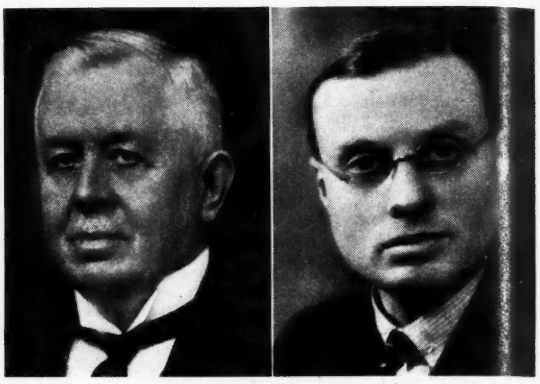
[H. Whitlock and Sons.
Mr. F. H. Ewens **Mr. G. A. Pope**

The Gaster Memorial Premium has been awarded to **Messrs. G. T. Winch** and **L. C. Jesty** for their paper "Television Images: an Analysis of their Essential Qualities," read at a recent meeting of the Illuminating Engineering Society.

Mr. C. S. Grace, B.Sc., F.I.C., has been appointed secretary of the Institute of Public Address Engineers. Inquiries concerning membership and other matters pertaining to the Institute should be addressed to him at 22, Spencer Road, Chiswick, London, W.4.

Dr. Alexander Russell, M.A., D.Sc., LL.D., F.R.S., is retiring from the position of principal of the Faraday House Engineering College. Dr. Russell, who was elected an honorary member of the Institution of Electrical Engineers in January last, was president of the Institution in 1923, and has received an Extra and the Overseas Premiums for contributions to the Institution's proceedings. He has been principal of Faraday House since 1909.

Dr. W. R. C. Coode-Adams, B.Sc. (Lond.), M.A., M.Sc., Ph.D. (Cantab), A.I.C., A.M.I.E.E., who succeeds Dr. Russell as principal of the Faraday House Engineering College, was born in 1895. He was educated at St. Paul's School from which he obtained a scholarship to Pembroke College, Cambridge, in 1914. During the war he served with the K.R.R., and later with the Royal Societies War Committee and on munition work. He returned to Cambridge after the armistice and passed Part I Mathematical Tripos and Part II Natural Science Tripos with first class honours in 1921. He went first to the Cheltenham Technical Schools and in 1925 secured an appointment at Faraday House, where he has been deputy principal since 1936.



[Elliott & Fry.
Dr. A. Russell **Dr. W. R. C. Coode-Adams**

Mr. W. G. Pickvance, M.I.E.E., M.I.Mech.E., has severed his connection with the Weston Electrical Instrument Co., Ltd., and has acquired the electrical engineering business of the late Mr. A. G. Tester at 194, Queen's Road, Hastings. Mr. Pickvance was, until 1920, engineer and manager of the Wrexham Corporation Electricity Department, which position he held for thirteen years, and was previously with the Malvern electricity supply undertaking and the Farnworth electricity works. He was one of the early members of the "Point Five" Association and chairman of that body in 1914. He has occupied the post of sales and technical representative for the Weston Company in the Liverpool, North Wales and Potteries section for the past seventeen years, and during the last five years has also had charge of the whole of the Lancashire and West Riding business.

Mr. W. G. Pickvance

In our reference to the "North Met." swimming gala (ELECTRICAL REVIEW, October 22nd, page 573) we described **Captain J. M. Donaldson** as engineer to the company; this was, of course, an error, as Captain Donaldson's correct title is "general manager" of the Northmet Company.

Mr. J. Hendry, managing director of Electric Control and Engineering, Ltd., has been elected president of the Chamber of Manufacturers of New South Wales for the session 1937-38. *The Electrical and Radio Trader* states that Mr. Hendry is a native of Lanarkshire, where he received his early training and graduated as an electrical and mechanical engineer; he later went to America for further experience. He is a past president of the Electrical Manufacturers' Association and a member of the Electricity Advisory Committee. Mr. Hendry was a member of the first committee appointed to draw up a safety code for the use of electricity in coal mines.

Mr. H. W. Clothier, who acts in a technical advisory capacity as a director of A. Reyrolle & Co., Ltd., J. H. Holmes & Co., Ltd., Parolle Electrical Plant Co., Ltd., and recently Pyrotenax, Ltd., sailed with Mrs. Clothier on October 29th in *S/S Strathaird* for a tour to Australia, New Zealand, and South Africa.

Mr. E. R. L. Fitzpayne

Mr. E. R. L. Fitzpayne, A.M.I.E.E., whose appointment as deputy transport manager was approved by the Glasgow Corporation Transport Committee on October 29th, is thirty-three years of age, and at present holds the position of deputy transport manager in Edinburgh. He graduated with honours in science (engineering) at Edinburgh University. He was chief technical assistant in Edinburgh Transport Department from from 1930-34, and for a year held the post of general manager and engineer of the Transport Department at South Shields prior to returning to Edinburgh. His appointment as deputy manager of the Glasgow Department is enhanced in importance by the prospect of succeeding to the position of general manager on the retirement of Mr. R. F. Smith, within six years, under the pension scheme.

Mr. J. Broadhurst

Mr. W. C. Waldron has been elected chairman of Erinoid, Ltd., in succession to the late Mr. A. Binnie.

Mr. J. Broadhurst, A.M.I.E.E., recently resigned his position with the Central Electricity Board and has taken up the appointment of resident engineer with Martin & Co., Electricity Supply Department, Calcutta.

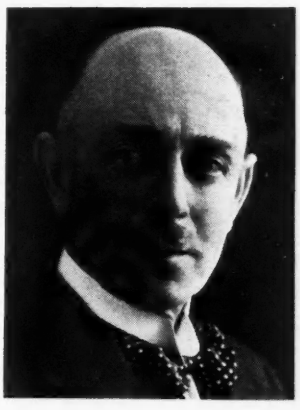
Mr. S. Lyon has resigned the chairmanship of the Ontario Hydro-Electric Commission which he has held since 1934. He will be succeeded as chairman by **Mr. T. H. Hogg,** who, since 1925, has been chief hydraulic engineer to the Commission, a post which, it is stated, he will retain.

Sir Alexander Roger, chairman of British Insulated Cables, Ltd., at the annual staff dinner at Adelphi Hotel, Liverpool, on Friday last, presented long-service medals to many employés and to **Mr. Thomas Harding,** chairman of the Staff Guild, a cheque for fifty guineas in recognition of fifty years' service.

Mr. G. M. Brewster was re-elected chairman of the Manchester and District Circle of Electrical Contractors, at the recent annual meeting of the Circle, and **Mr. J. W. Whiteley** was appointed deputy chairman.

Obituary

Mr. William Guy-Pell, M.I.E.E., whose death was announced in our last issue, was born in Hartlepool in 1860. He was educated at Bristol Grammar School and the College of Physical Science, Newcastle-on-Tyne. After a period of training at Hebburn Colliery, Durham, and in the marine engine shops and drawing office of T. Richardson & Sons, Hartlepool, from 1876 to 1881, he was engaged by Wynne & Co., civil engineers. In 1882 he commenced 15 years' service with the Brush Electrical Engineering Co., Ltd. (then the Anglo-American Brush Electric Light Co.), first as assistant manager of the dynamo factory in Borough Road, London, then as manager of the Scottish Branch, and finally as superintending engineer at head office. During this period he was in charge of the construction of the electricity supply works at many places, including Huddersfield, Hanley, Bath, Worcester, Dover, Leicester, Lancaster, Wandsworth, &c. He was the author of many papers on electrical subjects and made a number of inventions, including a widely known steam trap. In 1897 he joined Mr. F. M. T. Lange in the firm of Geipel & Lange, the forerunner of William Geipel, Ltd., of which company he was chairman till his death. The cremation took place at Woking on October 25th.



[*Elliott & Fry.*

The late Mr. W. Guy-Pell

Mr. D. Pearson, of Bradford, a representative of the Edison Swan Electric Co., and well-known as an expert on floodlighting, died from pneumonia on October 31st. Mr. Pearson, was forty years of age and leaves a widow.

Operations of London Transport

THE number of passenger journeys originating upon the London Passenger Transport Board's system during the year ended June 30th last was 3,636.4 millions, or 11.6 millions fewer than in the previous year as the immediate consequence of the strike of busmen in central London from May 1st to 27th. The total number of passengers covered by the pooling scheme with the main line railway companies (4,231.2 millions), however, represented an advance of 16.2 millions. Under the scheme the Board is entitled to 62 per cent. of the receipts from local passenger traffic in its area, after deducting certain operating and other allowances, and it thus continued to share in the special Coronation traffic of the main line railways, a good deal of which was diverted from the buses. Furthermore, a major part of the central bus expenses which continued during the strike was covered by allowances from the pool, so that on balance the Board was better off than in the previous year.

The net traffic receipts were £3,930,293, and other receipts £1,623,539. After deducting miscellaneous charges (£298,779) the net revenue was £5,260,053, an increase of £86,014 over the previous year. With the £30,843 balance in the London Transport "C" stock interest fund £5,290,896 was available for appropriation. On October 30th a final payment of 2¾ per cent. was made, bringing the total for the year up to 4¼ per cent. (4 per cent. last year), and a balance of £28,061 was carried forward.

Commenting on the accounts the report points out that taxation in one form or another was the second largest charge upon the Board's revenues. It is considered unreasonable that the Board should have to apply over 8 per cent. of its gross receipts to taxation, apart from income tax, and thus be prevented from having a margin of resources necessary for the discharge of its duty to provide an adequate and convenient passenger transport system.

Capital expenditure to the extent of £5,743,323 was incurred during the year upon additions and improvements to the system, £2,594,971 being in respect of railways, £1,380,898 on trolley-buses, and £377,705 on the electric power supply. Besides major works in connection with its underground railways the Board carried out further conversions of tram routes to trolley-bus operation, 350 new trolley-buses being brought into service and 329 trams withdrawn. It is stated that the trolley-bus has proved itself a popular vehicle and that the conversion continues to be justified on economic grounds, while the trolley-bus car mileage in 1936-37 was nearly three times that run in the previous year the level of receipts per car mile, itself higher than that of the trams, was not only maintained, but showed an increase of approximately 4 per cent. The number of passenger journeys on the trolley-buses was 203.1 millions (against 69.6 millions) and on the trams 904.5 millions (983.0 millions).

One of the statistical tables shows that 722.5 million kWh was supplied (696.9 million kWh in 1935-36), the average cost at low voltage being 0.515d. (0.511d.). A section relating to staff gives the number in the service of the Board at June 30th at 81,765, against 78,966 at the end of June last year. The average weekly earnings amounted to £4 2s. 9d., only 4 per cent. receiving less than £2 15s. The whole of the Board's operating staff with one year's service and upwards received a fortnight's holiday with pay. To prevent overlapping of duties and to secure better co-ordination the work of the Chief Electrical Engineer's Department was regrouped in three sections under Messrs. A. L. Lunn (generation), J. H. Parker (distribution), and P. R. Boulton (new works).

Further reference is made to traffic peaks, and it is pointed out that on the Board's railways 50 per cent. of the traffic moves in four hours. By the establishment of industries in the outer areas (48 per cent. of the net number of factories opened or extended in Great Britain in the five years ended December 31st last were in Greater London) not only have the main peak flows been accentuated but new local peaks have been created. On the other hand, the industrialisation of the outer zone has resulted in a small traffic moving in the direction opposite to that of the main peak flows.

New Books

Elementary Engineering Science. By A. MORLEY and E. HUGHES. Pp. 290; figs. 158. London: Longmans, Green & Co. Price 3s. 6d.

This excellent little volume has been written primarily with a view to meeting the demand for a text-book which will cover the common first-year course in engineering science for students preparing for the National Certificate in either mechanical or electrical engineering. It therefore sets out to give a foundation in the subjects generally studied under the titles of mechanics, heat and electricity, and magnetism. The authors, both of whom have had experience in the teaching of part-time students, realising the limitations of the human material upon which they have to work, have dealt with these subjects in a manner which should commend itself to teacher and student alike. The teacher knows that, as a rule, the part-time student has not any wide mathematical knowledge and so, while calculations are to be found in almost every chapter, these are of the simplest character, involving the possession of a knowledge of only very elementary algebra and trigonometry.

Of even greater value is the recognition which the authors have given to the student's point of view. They realise that the average young engineering student loves to deal with practical problems and so, both in the descriptive matter and in the numerical exercises, there is a very commendable use of ideas and facts with which the student is familiar. Thus, in dealing with moments, we do not get the "weightless, inextensible thread" of the pure mathematician, but problems on lifting tackle, beams and so on, while in dealing with the heating effects of electric current the problems concern electric radiators, kettles, and similar apparatus, the calculations including cost of running and similar understandable factors. At the end of each chapter there is, in addition to the numerical exercises (with answers), a brief summary which should prove of particular value to students whose work is interrupted by the exigencies of a part-time course.

While we can recommend this book as meeting the demands of the type of student for which it is specially written, we believe that it could be studied with much profit by the more advanced student who feels that his foundation of elementary science is not too secure, and also by the practical engineer who occasionally finds the necessity for revising the fundamental principles underlying his daily work.

Arc-Welding Handbook. By KARL MELLER. (Translated by J. E. Webb Ginger). Pp. 210; figs. 120. London: Hutchinson's Scientific and Technical Publications. Price 8s. 6d. net.

Many developments have taken place in the technique of electric arc welding during the last few years, and the practical applications of the electric arc are extending enormously. Amongst the materials which are now subjected to arc welding are cast iron and cast steel, aluminium, copper and nickel and their respective alloys. In the volume under review, the subject is treated in a highly practical manner and a study of the text will enable the operator to possess a better understanding of the processes involved and also gather an insight as to how recent researches are being applied to practical operations. Plant and technique are described in detail and the methods and processes applied in the choice and testing of electrodes are discussed and well illustrated.

After a short introductory chapter, the author deals with the carbon and metal arc welding processes and the physical nature of the arc. A broad outline is given of the conditions which must be met in d.c. welding operations, together with a summary of the general principles involved in welding generators and welding sets in general. The method adopted in all welding machines is that of regulating the field intensity so as to obtain the desired drooping characteristic. The means employed vary with different machines. The welding of steel is given prominence, including the types of welded joints, current strength, electrode size, arc length, manipulation of the electrode, shrinkage, distortion and labour and capital costs.

Welding is now employed for repairing and filling blow-holes in steel castings, such as are used for motor and generator housings, wheels and locomotive frames; a high nickel or chromium content is deleterious to a good welding of cast steel. The many difficulties experienced in welding aluminium are enumerated, and the high heat conductivity of copper is shown as an obstacle to arc welding. Nickel may be successfully arc welded resulting in great strength and high resistance to corrosion. The methods applied in testing welded joints are well illustrated.

First Year Engineering Science (Mechanical and Electrical). By. G. W. BIRD. Pp. 166; figs. 120. London: Sir Isaac Pitman & Co., Ltd. Price 5s.

This, the second edition, of a work originally published in 1933, has been revised by B. T. Tams, and now includes a chapter of eighteen pages on "Heat and Its Effects." The sections on gas laws and engine indicators have been omitted as they are dealt with in *Second Year Engineering Science* by the same author. The purpose of the work is to provide for students working for National Certificates in Mechanical and Electrical Engineering, and its limitations are due to the compression of matter relating to a wide field into a small number of pages. About a quarter of the letterpress is taken up by questions and answers, and several tables bearing upon the examples are included.

Shorter Notices

"Life's Spectrum," by W. E. Burnand, M.I.E.E. (Pp. 87). Sheffield: Sir W. C. Leng & Co., Ltd. Price 9d.—In the scope of this small volume the author endeavours to survey the fields of economics, science and invention, and life and death—a most difficult task. The result is most interesting although many of the conclusions may not be generally accepted by the reader.

"Generation, Transmission and Utilisation of Electrical Power," by A. T. Starr. Pp. 486; figs. 400. London: Sir Isaac Pitman & Sons. Price 18s.

"Transient Electric Currents," by H. H. Skilling. Pp. 349 figs. 85. London: McGraw-Hill Publishing Co. Price 25s.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

Champion Radio Valve Corporation, Ltd.—Private company. Registered October 22nd. Capital, £1,000. Objects: To carry on the business of radio valve and electrical bulb manufacturers, &c. The directors are: M. Bolsom, A.M.I.R.E., 31, Christopher Street, E.C.2, and S. Gootnick, M.I.R.E., 31, Bentinck Close, Regent's Park, N.W.8.

S. B. Hopkins & Co., Ltd.—Private company. Registered October 27th. Capital, £2,000. Objects: To carry on the business previously carried on by the Hopkins Electrical Co., and to conduct the business of electrical engineers and contractors, mechanical and constructional engineers, radio and television engineers, &c. The subscribers are: S. B. Hopkins and Mrs. M. Hopkins, both of 191, Park Road, Crouch End, N.8. The first directors are: S. B. Hopkins (chairman and permanent director) and M. Hopkins. Solicitors: Rexworthy, Bonsor & Wadkin, 83, Cannon Street, E.C.4.

Francis A. Fallon & Co., Ltd.—Private company. Registered in Dublin October 21st. Capital, £2,000. Objects: To carry on the business of electricians, electrical contractors, radio and electrical engineers, &c. The directors are: F. A. Fallon, "Faraday," Lenaboy Gardens, Lower Salthill, Galway, and three others.

H. S. Marsh, Ltd.—Private company. Registered October 28th. Capital, £500. Objects: To carry on the business of general, constructional, electrical, motor, mechanical, marine, radio, ventilating and heating engineers, &c. The subscribers are: H. A. Edwards and Mrs. Dorothy F. Edwards, both of Oakhurst, Betchworth Avenue, Earley, Reading. H. A. Edwards shall be permanent managing director. Registered office: 1, Bloomsbury Street, W.C.1.

Elmore Electric Clocks, Ltd.—Private company. Registered October 25th. Capital, £200. Objects: To carry on the business of manufacturers, importers and exporters of and wholesale and retail dealers in clocks, watches, chronometers, speedometers, recording and calculating machines, &c. The directors are: E. Hodgkinson (permanent managing director) and Mrs. E. Hodgkinson, both of 134, Wellesley Road, Chiswick, W.4. Secretary: G. Holden. Registered office: 108, Aldersgate Street, E.C.1.

H. E. Steer & Co., Ltd.—Private company. Registered October 28th. Capital, £500. Objects: To acquire the business of an electrical contractor carried on by Herbert E. Steer as Steer and Company at Bridge Works, Bridge Road, Willesden, N.W.10 and branches, &c. The directors are: H. E. Steer, 15, Rylett Road, Hammersmith, W.12; and J. W. Lawrence, 96, Hanover Road, Willesden, N.W.10. Registered office: Bridge Works, Bridge Road, N.W.10.

Percoid Development Co., Ltd.—Private company. Registered October 28th. Capital, £100. Objects: To carry on the business of manufacturers' agents for the sale of goods of any class, manufacturers of electrical appliances and refrigerating plant, &c. The directors are: R. A. Rumbold, Lostock, Station Road, Knowle, near Birmingham; and T. S. Dell, 57, Kingsway, Coventry. Registered office: 6, The Quadrant, Coventry.

Returns of Electrical Companies

Ashley Accessories, Ltd.—The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £2,500.

E. Shipton & Co., Ltd.—Satisfaction in full on April 3rd, 1937, of second debenture dated May 10th, 1932, and registered May 11th, 1932, securing £4,000.

Dulcetto-Polyphon, Ltd.—J. H. Stephens, of 6, Clements Lane, Lombard Street, E.C., ceased to act as receiver on October 21st, 1937.

Winsor Axia Fans, Ltd.—Bond and disposition in security dated January 22nd, 1931, charged on 110, Herries Road, Pollokshields, Glasgow (being property acquired by the company on September 9th, 1937). Amount owing £620 12s. 2d. Registered pursuant to Section 81 of the Companies Act, 1929. Mortgagees: Corporation of Glasgow.

R. Darbyshire (Wholesale), Ltd.—Capital, £2,000 in £1 shares. Return dated September 4th, 1937. 1,435 shares taken up. £1,435 paid. Mortgages and charges, nil.

Atlas Electric & General Trust, Ltd.—Capital, £6,500,000 in 3,000,000 preference, 3,000,000 ordinary and 500,000 unclassified shares of £1. Return dated July 22nd, 1937. All preference and ordinary shares taken up. £1,749,078 paid on 1,214,189 preference and 534,889 ordinary shares, £4,250,922 considered as paid on 1,785,811 preference and 2,465,111 ordinary shares. Mortgages and charges: £750,000.

Atherton Wireless Relay Co., Ltd.—Capital, £200 in £1 shares. Return dated January 13th (filed August 11th), 1937. All shares taken up. £200 paid. Mortgages and charges, nil.

Bowden & Higlett, Ltd.—Capital, £3,000 in £1 shares. Return dated August 25th, 1937. 2,025 shares taken up. £2,025 paid. Mortgages and charges, nil.

Bowyer-Lowe & A. E. D., Ltd.—C. Hastings, of 10, Prince Albert Street, Brighton, ceased to act as receiver and manager on October 14th, 1937.

Climax Radio Electric, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated October 22nd, 1937, to secure £2,000. Holder: H. A. Wooton, 94, Wake Green Road, Moseley, Birmingham.

Gradley Electrical Co., Ltd.—Capital, £2,000 in £1 shares. Return dated July 2nd (filed September 27th), 1937. 1,505 shares taken up. £505 paid, £1,000 considered as paid. Mortgages and charges, nil.

Economic Electric Co. (Liverpool), Ltd.—Capital, £10,000 in £1 shares. Return dated August 12th, 1937. 8,300 shares taken up. £8,300 considered as paid. Mortgages and charges: £2,929.

Auto Electrical Repairs, Ltd.—Capital, £1,000 in £1 shares. Return dated July 20th, 1937. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Associated Distributors, Ltd.—Capital, £80.000 in 50,000 10 per cent. cumulative preference and 30,000 ordinary shares of £1. Return dated July 7th, 1937. 43,400 preference and 30,000 ordinary shares taken up. £57,565 8s. paid (£1 on 43,400 preference and 13,332 ordinary and 1s. on 16,668 ordinary shares). Mortgages and charges: £17,056.

Aron Electricity Meter, Ltd.—Capital, £350.000 in £1 shares. Return dated July 9th, 1937. 151,936 shares taken up. £104,660 10s. paid on 75,968 shares (including premiums of 7s. 6d. per share on 75,773 shares and 28s. 6d. on 195 shares), £75,968 considered as paid on 75,968 shares. Mortgages and charges, nil.

British Electric Traction Co., Ltd.—Capital, £2,998,397 10s. in £712,744 5s. 6 per cent. cumulative participating preference stock; £287,256 6 per cent. cumulative participating preference shares of £1; £1,326,263 10s. 8 per cent. non-cumulative preferred ordinary stock; £78,032 preferred or deferred ordinary shares of £1, and £594,102 deferred ordinary stock. Return dated July 2nd, 1937. All stock taken up. £2,046,007 15s. paid, £587.102 considered as paid. Mortgages and charges: £1,639,539 0s. 7d.

Enfield Conduits Co., Ltd.—Capital, £1,000 in £1 shares. Return dated September 9th, 1937. 201 shares taken up. £201 paid. Mortgages and charges, nil.

H. C. W. Elton, Ltd.—Capital, £800 in £1 shares. Return dated August 25th, 1937. 570 shares taken up. £570 paid. Mortgages and charges, nil.

J. W. Gray & Son, Ltd.—Capital, £10.000 in 40,000 shares of 5s. Return dated July 7th, 1937. 36,000 shares taken up. £6,000 10s. paid on 24,002 shares, £2,999 10s. considered as paid on 11,998 shares. Mortgages and charges, nil.

Graver Cousins & Co., Ltd.—Capital, £255 in 200 preference and 5 ordinary shares of £1. Return dated June 21st, 1936 (filed August 6th, 1937). All shares taken up. £255 paid. Mortgages and charges, nil.

Exe Valley Electricity Co., Ltd.—The nominal capital has been increased by the addition of £25.000 in £1 ordinary shares beyond the registered capital of £175,000.

Cussins & Light, Ltd.—Particulars filed of £5,000 debentures authorised October 5th, 1937, charged on the company's undertaking and property, present and future, including uncalled capital (subject to mortgage dated May 12th, 1932, on Ariel House, Hull Road, Saint Lawrence, York), the whole amount being now issued.

Evans Lifts, Ltd.—Mortgage on freehold land and factory in Abbey Lane, Leicester, dated October 15th, 1937, to secure all moneys due or to become due from the company to the Midland Bank, Ltd.

Goldhawk Electric Co., Ltd.—A. E. Dunnell, of 113, Kingsway, W.C.2, was appointed receiver and manager on October 19th, 1937, under powers contained in debenture dated June 4th, 1937.

City Notes

Ensign Lamps, Ltd., held its annual meeting on October 27th, when Mr. H. Burroughes (chairman), who presided, said that, as mentioned in the prospectus, the directors had decided on the purchase of adjacent property. Those premises had now been acquired and had been remodelled to suit the business of the company. They anticipated that production would start in this factory during the early part of 1938. The sales of lamps had increased substantially during the first three months of the current financial year. The probability of that advance in turnover had been foreseen and the stocks of finished lamps had been increased during the summer months, enabling them to meet all demands.

Electric & Musical Industries reports a total revenue for the year ended September 30th of £473,413, as compared with £366,498 in the preceding year. Expenses were £105,547, an increase of £9,838, directors' fees require £3,902 and £50,000 is appropriated for income tax. The net balance is £313,964. The ordinary dividend is maintained at 10 per cent., and £277,334 is carried forward (against £201,872 brought in). Meeting: November 12th.

Warner's Radio & Electric, Ltd., has declared an interim dividend of 10 per cent., actual, less tax, on the ordinary shares. This compares with an interim last year of 30 per cent. per annum for the period December 18th, 1935, to March 31st, 1936, but the present interim is payable on an increased capital.

The Kalgoorlie Electric Power & Lighting Corporation has declared an interim dividend of 3 per cent., less tax at 2s. 6d. This is at the same rate as a year ago, but is being paid on a larger capital.

The British Oxygen Co. has declared an interim dividend of 7 per cent. on the ordinary stock. This is at the same rate as for the preceding year, but is payable on a capital of £2,841,252, as compared with £2,485,674.

The Southern Areas Electric Corporation, Ltd., has announced an interim dividend of 2 per cent. (against 1½ per cent.).

The Adelaide Electric Supply Co., has announced a final dividend of 5 per cent. on the ordinary stock, making 10 per cent. for the year (unchanged).

The Telephone Manufacturing Co. is paying an interim dividend of 2½ per cent., less tax. This is the same as for the previous year, but is being paid on increased capital.

Johnson & Phillips, Ltd., are maintaining the interim dividend at 5 per cent.

The City of Buenos Ayres Tramways (1904) is paying a quarterly dividend of 1s. 3d. per share (same).

The Anglo-Portuguese Telephone Co. has declared an interim dividend of 3 per cent., less tax (same).

Glenfield & Kennedy are maintaining the interim dividend at 5 per cent.

Stocks and Shares

GENERAL conditions in the Stock Exchange markets continue to be controlled more by foreign politics than by any other factor. That there is still plenty of money available for investment purposes is a matter upon which few Stock Exchange brokers entertain any doubt. A good many stocks and shares of the best type are more easy to sell than they are to buy. Business as a whole is, however, exceedingly quiet. For this season of the year, when markets reasonably anticipate a fair measure of activity, the volume of trade is disappointingly meagre. Every now and then rumours arise to the effect that the war in Spain is within sight of termination: last week-end very tentative proposals were reported from Japan in the direction of peace, but nothing definite has come to light. With uncertainty continuing to clog the wheels of enterprise and initiative, it can only to be expected that prices will show a halting disposition. Markets are, in a phrase, waiting for a lead.

London Transport Report

The results published in the London Transport Board's very full report bore out the impression that had been gained from the decision to raise the dividend payment on the "C" stock from 4 to 4¼ per cent. In other words, the profits were a good deal better than had been expected from what was known to have proved a difficult year. The price of the "C" stock, at 79, was not further affected. Public interest is now advanced a year to the crucial point where the Board must pay 5½ per cent. on the "C" stock, or risk the appointment of a receiver. To cover the standard dividend, profits for this year would need to rise by about £320,000. While few people look to see an expansion of this order, it is considered possible that the balance may be made good by way of a smaller appropriation for renewals, which item has been receiving an austerely high allowance. It seems, however, just as likely that the Board will feel justified in ignoring possible consequences, and in merely paying such dividends as are warranted by the results and the outlook.

Electricity Supply

The absence of fluctuations, either one way or the other, in electricity supply share prices reflect the composure with which the market awaits such legislation for the industry as may be introduced during the present Parliamentary session. In the meantime, interest is occupied with the manner in which certain sections of the industry are putting into effect their own ideas of amalgamation. An example of this tendency has come, in the last week, from the North Wales and South Cheshire plan, and from the proposed physical amalgamation of the group controlled by London Associated Undertakings. Of more practical moment to the market was the raising of the interim dividend on Southern Areas shares from 1½ to 2 per cent. Expectation now hopes for a final payment to make 5½ per cent., as against the 4½ per cent. paid for last year. On this consideration the price of the shares strengthened to

21s. 3d. ex dividend, at which price the yield on a 5½ per cent. distribution would be over 5 per cent. In the foreign group, Palestine Electric "A" shares weakened further to 33s., and Jerusalems to 24s. Perak Hydros, at 24s. 6d., are a few pence down.

Industrial Markets

The moderate rises which took place during the past week in the prices of General Electric and Associated Electrical shares are fairly representative of the tendency in the industrial market. The turn for the better seems to be due to a slightly more cheerful tone in Wall Street. Other electrical equipment shares to move upwards were Crompton Parkinsons, now 55s., and British Insulated 4$\frac{11}{16}$. A good report is expected this month from the former company. Brush, at 29½, have turned dull on the approach of the date for publication of the results: these are promised for early December, and will cover a period of eighteen months to June last. Enfield Cables, at 5$\frac{1}{8}$, have shed $\frac{1}{16}$. Callenders, at 4½, are $\frac{1}{16}$ better.

The American Scene

London stock markets have shown little capacity for taking a course independently of events in Wall Sreet. Happenings in America continue, therefore, to occupy much of the Home investor's attention as regards both the technical position of markets and the outlook for American business. Market conditions in the New York Stock Exchange are looking rather better as the result of an alteration made in the rules that govern the marginal requirements from speculators. While this basis for an improvement in prices is regarded as being of a technical and somewhat precarious kind, the step was, nevertheless, welcome as a sign that Washington is beginning to take an interest where previously an aloof attitude had been maintained. For more solid recovery, everyone recognises that the United States markets will need the stimulus of progressive conditions in trade and business.

U.S. Business Conditions

Industrial recovery in America has obviously reached a delicate stage. The expected autumn activity has mis-fired, and people are afraid that an upward swing is in for serious delay. Industry protests that New Deal measures are a serious threat to its welfare. Rising expenses and taxation are said to have put up the cost of its products so high as to discourage demand; the same factors, allied to market conditions and to regulations on capital issues, are claimed to militate against expansion in the way of capital construction and investment. While this feeling exists, Wall Street can scarcely be expected to stage a lasting recovery. Markets need some assurance that industry will have room to breathe and to earn the profits which, in the long run, determine quotations. The decision on marginal requirements has encouraged a small measure of hope for assistance over a wider field. Meanwhile, the importance of American conditions to world prosperity makes it certain that holders of British securities of all kinds, however remote the apparent connection with America, will watch with closest attention the progress of affairs across the Atlantic.

Fixed Trusts

Several fixed trust companies are sounding their unitholders on the question of whether they, the proprietors, would be agreeable to conversion of their companies into trusts of the familiar managed type. There seems to be a growing feeling that the latter are, for general purposes, a more satisfactory medium for the investment of money over a wide field. The Electrical Industries Trust, being of a flexible kind, comes somewhere between the two. The management is permitted to invest within the limits of a group of forty-one electricity supply and manufacturing shares, among them, incidentally, being many of those which occur in the list of prices accompanying this column. Electricity supply shares constitute at present 16.8 per cent. and manufacturing shares 83.1 per cent. of the total holdings. Distributions to unit-holders amounted in the last full year to about £4 2s. per cent. from cash dividends and £1 5s. per cent. from recurring bonuses and rights. The price of the units is 18s. 6d.

Miscellaneous Matters

Prices in the gilt-edged market are still moving upwards: several quotations in the list of Government stocks show gains of a point or more over the past fortnight. But London and Home Counties 4½ per cents. are marked down to 109. Home Railway stocks appear to be waiting for some more decided encouragement from the weekly traffic returns, which are expected to make a better showing as a result of the higher charges now in force. British Electric Traction deferred recovered to 1,100, but there is little change in Tillings, at 58s. 6d. Brazilian Tractions are 17$\frac{3}{8}$, after having been up to 18$\frac{3}{8}$, as compared with 15$\frac{3}{8}$ a fortnight ago. Communication stocks are generally steadier. The Cable and Wireless issues are not quotably altered, and there is little change in the Transatlantic stocks. Great Northern Telegraphs fell 10s. to 38½. The market in iron and steel shares is uncertain. Vickers are dull at 27s. British Aluminiums are a good spot at 47s. There is usually an active market in these shares; the new, issued at 42s. 6d., have hardened to 2s. 7½d. premium. The rubber market is in the doldrums, together with the price of the commodity.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price Nov. 2.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	67/6	—	4 9 0
City of London	1	7½	7½	34/6	—	4 7 0
Clyde Valley	1	7	8	39/6	−6d.	4 1 0
County of London	1	10½	10½	49/–	—	4 5 9
Edmundson's 7% Pref.	1	7	7	33/6	—	4 3 7
Do. Ord.	1	8	9	39/–	—	4 12 4
Elec. Dis. Yorkshire	1	9	9	41/6	—	4 6 10
Elec. Fin. and Securities	1	12½	12½	2⅝	—	4 15 3
Elec. Supply Corporation	1	11	12	52/–	−6d.	4 12 5
Lancs Light and Power	1	7½	7½	33/–	+6d.	4 11 0
Lond. Assoc. Electric	1	—	7	31/3	—	4 9 6
London Electric	1	7	8	35/6	—	4 10 2
London Power Deb. Red.	Stock	5	5	106½	+1	4 14 0
Metropolitan	1	10	10	46/–	—	4 7 0
Midland Counties	1	7½	8	37/6	—	4 5 4
Mid. Elec. Power	1	8	9	2½	—	4 4 8
North Eastern Electric Ordinary	1	6	7	32/–	—	4 7 6
Do. 7% Pref.	1	7	7	34/–	—	4 2 4
Northampton	1	10	10	45/–	—	4 9 2
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	48/9	—	4 2 1
Do. do. 6% Pref.	1	6	6	30/–xd.	—	4 0 0
Scottish Power	1	8	8	37/–	—	4 6 6
South London	1	7	7	32/–	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/–	—	7 2 10
Yorkshire Elec.	1	8	8	2	—	4 0 0
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	112½	—	4 9 0
Do. 1955–75	,,	5	5	115	—	4 7 0
Do. 1951–73	,,	4½	4½	109	—	4 2 7
Do. 1963–93	,,	—	3½	98xd.	+1	3 11 5
London Elec. Trans. Gtd.	,,	—	2½	90	—	2 15 6
London & Home Counties, 1955–75	,,	4½	4½	109	−2	4 2 7
London Passenger Transport, A.	,,	—	4½	114½	+1	3 18 7
Do. do. B.	,,	—	5	117½	—	4 5 1
Do. do. C.	,,	4	4½	79	—	5 7 8
West Midlands Joint Elec. 1948–68	,,	—	5	112	—	4 9 3
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$160	9	9	155	—	5 15 7
Anglo-Am. Tel. Pref.	Stock	6	6	114½xd.	+1	5 4 10
Do. Def.	,,	1½	1½	28½	—	5 5 3
Cable & Wireless 5½% Pref.	,,	4½	5½	101½	—	5 9 5
Do. Ord.	,,	—	—	67½	—	—
Do. Income	,,	—	—	101½	—	3 18 10
Globe Tel. & Tel. Ord.	10	4½*	5½*	16	—	3 8 8
Do. do. Pref.	10	6	6	14	—	4 5 9
Great Northern Tel.	10	20	20	38½	−½	5 4 0
Marconi-Marine	1	10	7½	33/9	—	4 9 0
Oriental Telephone Ord.	1	12*	12*	2$\frac{15}{16}$	—	4 0 0
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	6/3	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	19½	+2	—
British Electric Traction Def. Ord.	,,	5	5	1100	+25	—
Do. do. Pref. Ord.	,,	8	8	168	—	4 15 5
Brazil Traction	$100	40 cts.	50 cts.	17⅝	+¼	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	—	—
Do. 1st Bonds	$500	5	5	33	—	—
Victoria Falls Ord.	1	20	12	3$\frac{1}{16}$	—	3 18 5
West Riding	1	6½	10	2	—	5 0 0
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	15	15	2⅜	—	6 6 4
Assoc. Elec. Ord.	1	8	10	45/–	+6d.	4 9 0
Do. Pref.	1	8	8	37/6	—	4 5 3
Babcock & Wilcox	1	8	10	45/–	−$\frac{1}{16}$	4 9 0
British Aluminium Ord.	1	7½	10	47/–	+9d.	4 5 1
British Insulated Ord.	Stock	20	20	4$\frac{11}{16}$	+$\frac{1}{16}$	4 5 3
Brush Ord.	Stock	Nil	Nil	29½	−4	—
Callender's	1	15	15	4½	+$\frac{1}{16}$	3 6 8
Do. 6½% Pref.	1	6½	6½	31/3	—	4 2 4
Crompton Parkinson Ord.	5/–	12½	12½	2⅜	+⅛	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	7	10	1$\frac{15}{16}$	—	5 10 4
Enfield Cable Ord.	1	25	25	5⅛	−$\frac{1}{16}$	4 17 8
English Electric	1	Nil	Nil	31/6	+6d.	—
Do. do. Pref.	1	6½	6½	26/6	—	4 18 1
Ericsson Tel.	5/–	20	25	2$\frac{1}{16}$	—	2 17 2
Ever Ready	5/–	35	45	29/–xd.	+6d.	7 15 2
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	15	17½	79/6	+1/–	4 8 0
Henley's	5/–	30	15	1	—	3 15 0
Do. 4½% Pref.	1	4½	4½	1⅛	—	4 0 0
India-Rubber Pref.	1	5½	5½	21/3	—	5 3 6
Johnson & Phillips	1	7½	10	43/9xd.	+2/–	4 11 5
Lancashire Dynamo	1	10	20	3⅜	—	5 18 6
Siemens Ord.	1	6	7½	30/9	—	4 17 7
Telegraph Construction	£1	Nil	7½	2½	—	3 6 8

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken

1936

3045. "Television receiving apparatus." H. R. Lubcke. January 31st, 1936. (473059.)

6532. "Apparatus analysing sound-waves or electric oscillations comprising a band of frequencies." G. W. Walton. March 4th, 1936. (473128.)

6569. "Radio transmission systems." J. Robinson. March 4th, 1936. (473272.)

6711. "Arrangement for the electrical long-distance repetition of measured values such as hand positions, resistance variations, and the like." L. G. Szell. March 5th, 1936. (473274.)

7135. "Variable-electric condensers." Siemens & Halske Akt.-Ges. March 9th, 1935. (473275.)

7205. "Rectifiers for alternating current." A. D. Blumlein. March 10th, 1936. (473276.)

9779. "Electric wiring systems." Okonite-Callender Cable Co., Inc. May 2nd, 1935. (473134.)

9784. "Electric time-switches." British Sangamo Co., Ltd., and F. R. Butherus. April 2nd, 1936. (473186.)

9935. "Control systems for electric motors." English Electric Co., Ltd., and A. Raworth. April 3rd, 1936. (473137.)

10023. "Electrical accumulators." W. W. Groves (Deutsche Celluloid-Fabrik). April 4th, 1936. (473194.)

10067. "Electric convertors." Siemens Bros. & Co., Ltd., and H. S. Double. April 6th, 1936. (473281.)

10101. "Electro-magnetically operated valves." Laundry Automatic Appliances, Ltd., and S. H. Ribbans. April 6th, 1936. (473140.)

10112. "Automatic switches for use in telephone or like systems." Automatic Electric Co., Ltd., and D. Wright. April 6th, 1936. (473141.)

10131. "Carrier signalling systems." Telephone Manufacturing Co., Ltd., and L. H. Paddle. April 6th, 1936. (473330.)

10136. "Electric air-conditioning machines." W. Dawson and A. Jackson. April 6th, 1936. (473144.)

10153. "Electric-discharge devices." British Thomson-Houston Co., Ltd., L. J. Davies and J. A. V. Fairbrother. April 6th, 1936. (473332.)

10170. "Electric blasting detonators and the like." L. Rubenstein, W. Taylor, and Imperial Chemical Industries, Ltd. April 6th, 1936. (473146.)

10171. "Electrodeposition of zinc." Imperial Chemical Industries, Ltd. April 4th, 1935. (473147.)

10201. "Fusible electric cut-outs." Belling & Lee, and F. R. W. Strafford. April 7th, 1936. (473335.)

10299. "Connecting devices for electric conductors." C. H. Ford. April 8th, 1936. (473289.)

10300. "Thermionic valve circuits." E. L. C. White. April 8th, 1936. (473028.)

10336. "Method of producing Braun tubes." Radioakt-Ges. D. S. Loewe. April 17th, 1935. (473290.)

10389. "Thermionic cathodes producing a directed electron beam." V. Zeitline, A. Zeitline and V. Kliatchko. April 8th, 1935. (473149.)

10397. "Electric convector heaters." C. G. Greene. April 8th, 1936. (473074.)

10537. "Electric-discharge lamps." Siemens Electric Lamps & Supplies, Ltd., and J. N. Aldington. April 9th, 1936. (473347.)

10542. "Colour television and the like." Baird Television, Ltd., and J. L. Baird. April 9th, 1936. (473303.)

10543. "Methods of producing reflecting surfaces." Baird Television, Ltd., and J. L. Baird. April 9th, 1936. (473150.)

10544. "Electron-discharge devices for use in television and like systems." Baird Television, Ltd., and V. Jones. April 9th, 1936. (473348.)

10548. "Electrical switching apparatus and contact springs therefor." S. Blomqvist and S. D. Vigren. April 9th, 1936. (473305.)

10569. "End fittings for multi-core sheathed electric cables." Solution Trust, Ltd. April 10th, 1935. (473307.)

10697. "Electric low-temperature heating appliances." W. M. Betts. April 14th, 1936. (473029.)

10863. "Laying of electric cables." T. E. Haywood and General Railway Signal Co., Ltd. April 15th, 1936. (473152.)

12354. "Vacuum-tight seals between metals and ceramic materials." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). April 30th, 1936. (473155.)

13866. "Electric potentiometers." Steatit-Magnesia Akt.-Ges. June 7th, 1935. (473086.)

14190. "Apparatus for demonstrating the properties of alternating electric potentials." C. Buckle. May 19th, 1936. (473210.)

14696. "Protective means for electric circuit-breakers." G. Ellison, Ltd., and J. Anderson. May 25th, 1936. (473157.)

15352. "Electrical plug- and socket-couplings." J. A. Crabtree & Co., Ltd., and H. F. McLoughlin. June 2nd, 1936. (473213.)

17051. "Cable and terminal." W. S. Graff-Baker, and London Passenger Transport Board. June 19th, 1936. (473091.)

17316. "Vapour electric convertors." General Electric Co., Ltd., E. Gallizia, and W. Schiff. June 22nd, 1936. (473035.)

19269. "Electric lampholders." A. Behrman. September 16th, 1936. (473095.)

20414. "Electric overload cut-out." Vereinigte Glühlampen Elektrizitats Akt.-Ges. July 23rd, 1935. (473162.)

21246. "Electric control device for the winding mechanism of aerials of aircraft." Romeylowerk Ges für Drahtlose Nachrichtentechnik. September 27th, 1935. (473099.)

22172. "Securing means for the screw spigots of electric current connections on electric lamps, connecting plugs, fuse plugs, and so forth." J. Kros. August 12th, 1936. (473101.)

30330. "Television and like apparatus." P. M. G. Toulon. November 6th, 1935. (473166.)

33315. "Multi-element electron-discharge apparatus and systems." Standard Telephones & Cables, Ltd. January 11th, 1936. (473042.)

34139. "High-frequency electrical filters." Marconi's Wireless Telegraph Co., Ltd. January 20th, 1936. (473116.)

34159. "Method of and system for determining positions by means of a rotating radio beacon." C. Lorenz Akt.-Ges. December 12th, 1935. (Addition to 447707.) (Cognate application 34160/36.) (473167.)

34954. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. December 19th, 1935. (473168.)

35746. "Battery grid pasting machines." Usl Battery Corporation. April 3rd, 1935. (Divided out of 9895/36.) (473118.)

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1972. "Cathode-ray tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 25th, 1936. (473173.)

4810. "Air-cooling arrangements for dynamo-electric machines." Siemens-Schuckertwerke Akt.-Ges. February 29th, 1936. (473176.)

7109. "Devices for connecting electric wires." W. Norres (trading as Pyrotechnisches Laboratorium W. Norres). March 12th, 1936. (473233.)

7444. "Electric arc lamps." J. E. Pollak (Korting & Mathiesen Akt.-Ges.). March 13th, 1937. (473234.)

7517. "Electric-lighting fittings." G. F. Hardy and Roxaflex, Ltd. March 15th, 1937. (473236.)

7749. "Colour-television and the like." Baird Television, Ltd., and J. L. Baird. April 9th, 1936 (divided out of 473303). (473323.)

7818. "Magnetic materials suitable for dust-cores." Siemens & Halske Akt.-Ges. March 17th, 1936. (473238.)

8435. "Electric remote selective control systems." L. E. W. Montrose-Oster and Pollopas Patents, Ltd. March 22nd, 1937. (473242.)

8675. "Methods of storing and recovering the surplus electrical energy temporarily delivered by large wind-driven dynamos." H. Honnef. March 28th, 1936. (473324.)

10373. "Two-part electrical couplings." Cinch Manufacturing Corporation. May 13th, 1936. (473243.)

11694. "Electric ignition systems for internal-combustion engines." British Thomson-Houston Co., Ltd. April 25th, 1936. (473250.)

13424. "Dwarf electric incandescent lamps." General Electric Co., Ltd. May 25th, 1936. (473257.)

15141. "Electrical connecting appliances." P. Krageloh and H. Krageloh (trading as T. Krageloh & Co.). October 24th, 1936. (473259.)

19216. "Casings for electric time switches or like apparatus." British Sangamo Co., Ltd., and F. R. Butherus. April 2nd, 1936. (Divided out of 473186.) (473262.)

19217. "Protection of electric time switches." British Sangamo Co., Ltd., and F. R. Butherus. April 2nd, 1936. (Divided out of 473186.) (473263.)

21378/9. "Control systems for electric motors." English Electric Co., Ltd., and A. Raworth. April 3rd, 1936. (Divided out of 473137.) (473179/80.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 27th :—

Braybar. No. 577372. Class 8. Electrical resistances.—George Bray & Co., Ltd., Bagby Works, Leicester Place, Leeds.

Sharborn. No. 579080. Class 8. Electric relays. No. 579081. Class 13. Electric switches (ordinary).—W. T. Henley's Telegraph Works Co., Ltd., 11, Holborn Viaduct, E.C.1.

Saturex. No. 580037. All goods in Class 8.—Standard Telephones & Cables, Ltd., Connaught House, 63, Aldwych, W.C.2.

Petoscope. No. 580036. Class 8. Photo-electric apparatus for detecting the presence and movements of moving objects.—Standard Telephones & Cables, Ltd., address above.

Infray. No. 575819. Class 11. Electro-medical apparatus.—John Thomas Corneille, Brettenham House, Lancaster Place, Strand, W.C.2.

Rawl. No. 579081. Class 13. Metal goods.—The Rawlplug Co., Ltd., Rawlplug House, Cromwell Road, South Kensington, S.W.7.

Buna. No. 577424. Class 50. Compositions consisting mainly of reaction products obtained by the polymerisation of butadiene hydrocarbons, sold in the form of sheets, blocks, tubes, rods and shaped pieces, for use as substitutes for indiarubber.—The I.G. Farbenindustrie Gesellschaft, Frankfurt-am-Main, Germany (British representatives, Abel & Imray, 30, Southampton Buildings, Chancery Lane, W.C.2).

Stellite. No. 577997. Class 50. Tubes made of paper impregnated with synthetic resin for electrical and textile purposes.—J. Stell & Sons, Ltd., Holme Mills, Keighley, Yorks.

Metrosil. No. 579094. Class 50. Compounds or substances consisting mainly of ball clay, carborundum and graphite for use in the manufacture of electrical resistances.—The Metropolitan-Vickers Electrical Co., Ltd., 1, Kingsway, W.C.2.

Electrical Export Practice

Concurrent with the period of the next British Industries Fair the Institute of Export, 11, Aldwych, W.C.2, is organising a special series of lunch-hour lectures on export practice for the electrical industry. The secretary, Mr. W. T. Day, is collaborating with well-known specialists who will concentrate on the technical needs and practical aspects of sales promotion abroad. Before issuing the complete programme Mr. Day would like to hear from additional collaborators.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ardwick.—Dwellings (244), Bennett Street, for Manchester T.C.; housing director, Town Hall, Manchester, 2.

Ayrshire.—Extension to Cumnock Academy (£35,000); architect, County Council Education Committee, Ayr.

Bacup.—School, Blackthorn (£37,000), for E.C.

Barking.—Factory and offices, River Road; Universal Waste Reclaiming Co., Ltd. School, Manor (£64,126); J. A. Perriss, Ltd.

Bexhill-on-Sea. — Out-patients' dept., Bexhill hospital (£17,000); J. E. Maynard, architect, 1, Collington Avenue.

Billingham-on-Tees.—Houses; Stephen Coates, Ltd., builders, Middlesbrough.

Birmingham.—Factory, Aston Road North; Elvins & Son, builders, Soho Road, Handsworth. Factory and office for Musgrove & Green, Ltd., Bradford Street; C. Green & Son, builders, Richmond Road.

Blyth.—School, Bebside (£24,000); T. Nicholson, contractor, Croft Road, Blyth.

Bridgwater.—Houses (80), various parishes; R.D.C. surveyor.

Burnley.—Houses (100), Rosehill, Stoops, and Palace House estates; borough surveyor.

Chapel-en-le-Frith.—Houses (24), near Ashbourne Lane; G. & S. Bloor.

Chelmsford.—Houses, Second Avenue and Third Avenue; H. J. Jackson & Co. Shops, Broomfield Road, Patching Hall estate; A. J. Wells.

Chester.—Houses (80), Lache housing scheme, 3rd contract; C. Greenwood, city surveyor, Municipal Offices. School, Norris Road, Sale Moor; F. Anstead Browne, architect, The Castle, Chester.

Chesterfield.—Houses (80), Bacon's Lane site; borough surveyor. Houses, near Derby Main Road and Mill Lane, Wingerworth; Houfton and Kington, architects, Market Place, Chesterfield.

Coventry.—Houses (611), Grange estate, Keresley; H. Whiteman, architect, Priory Row, Coventry. Extensions to factory, for Airlite Trailer Co., Clay Lane.

Croydon.—Houses (62) and flats, Davidson Road estate; borough engineer, Town Hall.

Darlington.—Houses (62), Geneva Road East; Bussey and Armstrong, builders, Brinkburn Street.

Derby.—Extensions to Market hall (£12,200); borough engineer.

Dudley.—Houses (208), Rosland estate, and police buildings (£50,000), New Street; F. H. Gibbons, surveyor, Council House. Hotel, Priory Road, for Mitchells and Butlers, Ltd., Cape Hill, Birmingham.

Dumfries.—Hotel, English Street, for J. J. Girotti, Nithsdale Hotel.

Dunfermline.—Business premises, &c. (£15,000), for F. W. Woolworth & Co., Ltd.

Ealing.—Houses (80), Laughton Road; Henry Boot (Garden Estates), Ltd. School, L.C.C. estate, Hanwell, for the Ealing E.C.

Easington.—Houses, Gore Hall and Wibgate; R.D.C. surveyor.

Ebbw Vale.—Cinema, West End House site, for M. Corne, Cardiff.

Edinburgh.—Extensions for Royal Blind Asylum and School (£20,000); the superintendent.

Eighton Banks (DURHAM).—School (£12,000); F. Willey, architect, 34, Old Elvet, Durham.

Enfield.—Radio factory, Lincoln Road; Co-operative Wholesale Society, Ltd.

Fareham.—Rebuilding, Alexandra cinema, for Shipman & King; J. Hunt, Ltd., contractors, Gosport.

Finchley.—Flats (41), Red Lion Hill estate (£19,089); borough engineer.

Gillingham.—Enlargement of Nafin Street school (£29,696) for E.C.

Glamorganshire.—School, Whitchurch (£30,558), for the County E.C.

Glasgow.—Offices and cinema, Empire Exhibition; Scottish Oil, Ltd. Extensions to Zenith works, Thornliebank; Henry Wiggin & Co., Ltd.

Gloucestershire.—Extensions to Art School, Cheltenham, for County E.C.

Hampshire.—Schools, Basingstoke (£28,000), and Fareham, for the County E.C. School, Brockenhurst, for the C.C.; A. L. Roberts, county architect, The Castle, Winchester.

Harwich.—Houses (28), Upper Dovercourt; A. Hewitt.

Haslingden.—Houses (49), and flats; borough surveyor.

Hetton-le-Hole.—Houses (53); J. Wears and Sons, contractors, Grange Villa, Chester-le-Street.

Hull.—Cinema, Calvert Lane, for Priory Cinemas, Ltd., Paragon House, Paragon Street; E. C. S. Stow, director, York Lodge, Southfield, Hessle.

Ilford.—Houses (42), Braintree Avenue; P. G. Ashton & Sons. Houses (326), Mossford Park estate; New Ideal Homesteads, Ltd., Ideal House, Carlton Road, Erith. Houses (20), Somerville Road; J. T. Perrin, architect, 279, Hampton Road. Extensions to Isolation hospital (£21,000); borough engineer.

Isleworth.—Administration block and alterations and additions to Busch House; J. G. Carey, borough surveyor, Council House, Hounslow.

Kent.—Schools, Culverstone, Meopham and Hoo, for the County E.C., Maidstone.

Kettering.—Coliseum (£25,000), Russell Street, recently destroyed by fire; Leightons (Contractors), Ltd., Potters Bar, Middlesex. Schools, Windmill Avenue (£36,658); W. Thompson & Sons, Ltd., Irthlingborough.

Kirkcaldy.—Municipal buildings (£82,700); D. Carr, architect, 3, Rutland Square.

Lancashire.—School, Colne (£50,650), for the County E.C.; J. Partington, Ltd., contractors, Middleton Junction, Manchester.

Letchworth.—Dwellings (147), Wilbury Road, for Howard Cottage Society, Ltd.; J. Ray, Ltd., contractors, Letchworth.

Limehurst.—Houses, Bardsley Little Moss and Waterloo; R. Thompson, architect, Council Offices, Oldham Road, Waterloo.

Liverpool.—Houses (2,000), Woolfall Heath estate, for the C.C.; Unit Construction Co., Ltd., contractors.

London.—(HACKNEY).—Enlargement of Institution (£21,905); C. P. Roberts & Co., Ltd., 31, High Holborn, W.C.1. (HAMMERSMITH).—Premises for British Home Stores, Ltd., King Street; A. L. Farman, 42, Richmond Park Road, S.W.14. Shops and offices, Latimer Court; Hillier, Parker, May & Rowden, 27, Maddox Street, W.1. Town hall (£219,541); Allen Fairhead & Sons, contractors, Enfield. (ISLINGTON).—Tenements (50), North Avenue (£27,877); John Knox (Bristol), Ltd. (KENSINGTON).—Tenements, South Road (£43,600); borough engineer. (LAMBETH).—Dwellings, Evans Cottage area (£12,683); W. H. Gaze & Sons, Ltd. Extensions to hospital (£36,264); C. Miskin & Sons, Ltd., Romeland, St. Albans. (POPLAR).—Factory, Old Ford Road; H. E. English, 488, Bethnal Green Road, E.2. Flats, Bow Road and Coventry estate (£36,000); L.C.C. architect, County Hall, Westminster Bridge, S.E.1. Nurses' home, St. Clement's hospital (£25,083); W. H. Gaze & Sons, Ltd. Rebuilding factory, High Street; Hobden & Porri, 13, Great James Street, W.C.1. (WANDSWORTH).—Dwellings, Tooting Grove (£28,276); borough engineer. (CLAPHAM).—Dwellings, Poynders Road (£14,799); W. J. Simms, Sons & Cooke, Ltd., 2, Featherstone Buildings, London, W.C.1.

Macclesfield.—Additions to the Parkside Memorial hospital; F. Anstead Browne, architect, The Castle, Chester.

Mansfield.—Houses (33), Charnwood Grove; Ling Forest Estates, Ltd. Houses (12), The Knoll; Radford & Jenkins. Houses, Racecourse estate and Pleasley estate; borough engineer.

Middlesbrough.—Houses (82), Chalford Gardens, &c., for W. Robinson; T. Crawford, architect, 82, Borough Road, Middlesbrough. Extensions to Park Road fire station (£16,395); borough engineer.

Morecambe.—Houses (21), Burlington Grove; J. Westwell. Houses (23), Low Lane; H. Priestley.

Newburn-on-Tyne.—School; J. Murray, contractor, Heddon-on-the-Wall.

Newbury.—Houses (40), Greenham Court estate; Mr. Palmer.

North Shields.—Sports stadium for C. Young and A. Hedley (£100,000); Marshall, Tweedy & Bourn, architects, 129, Pilgrim Street, Newcastle-on-Tyne.

Northern Ireland.—(OMAGH).—Extensions to District Mental Hospital (£21,935), for Board of Management; W. Dowling & Sons, Ltd., builders, Cromwell Road, Belfast.

Nottingham.—Extensions to factory, Radford, for John Player & Sons.

Nuneaton.—Houses (28), Vernons Lane estate; borough surveyor, Council House. Shops and assembly hall, Queen's Road, for the Nuneaton Co-operative Society, Ltd.; H. N. Jepson, architect, Midland Bank Chambers.

Oldbury.—Houses (56), near Wolverhampton Road; Titford Property Co.

Portsmouth.—Houses (600), Cosham, for City Health Committee.

Richmond (SURREY).—Dwellings (112), Ham; borough engineer, Hotham House, Heron Court.

Shipley.—Houses (158), Wrose Road; A. Greenwood.

Southall.—Houses (122), Dormers Wells estate; borough engineer.

Southend-on-Sea.—Factory and stores, Pleasant Road, for Grosvenor Confectionery Co., Ltd., Marine Parade.

South Shields.—Houses (652), Horsley Hill; J. Reid, borough engineer, Town Hall. Extensions to the Hospital; G. Henderson, builder, Boldon Lane, East Boldon.

Staines.—Shops, Kingston Road; G. W. Hodge.

Sutton Coldfield.—Houses (66), George Road; F. Morris.

Swansea.—Factory, Landore; Imperial Chemical Industries, Ltd. Magnesium factory, for Magnesium Metal Corporation.

Swinton.—School, Grosvenor Road, for E.C.

Thornton Cleveleys.—Concert hall and café, site adjoining Jubilee Gardens; H. Fenton, U.D.C. surveyor.

Tottenham.—Extensions to works, Lawrence Road; Cronite Foundry Co., Ltd.

Tynemouth.—Houses (214), Waterville Road, &c., and town hall; D. M. O'Herlihy, borough engineer.

Uxbridge.—Shops and flats, Long Lane; W. E. Guy.

Warrington.—Additions to works, Academy Street; E. Richardson & Son, Ltd.

Wavertree.—School, Mosspits Lane, for Liverpool T.C.; J. Rimmer & Son, Ltd., builders, Low Hill, Liverpool.

Wednesbury.—Factory and offices near Dangerfield Lane, for Henry Hope & Sons, Ltd., Halford works, Smethwick, Birmingham.

Wellingborough.—Factory for Whitworth Bros., Victoria mills.

West Bromwich.—Office block (£50,000) for J. Brockhouse & Co., Ltd., Hill Top.

Weymouth.—Houses (88) and flats, Goldcroft estate; borough engineer. Houses (30), Marlborough Drive; Andrews & Andrews.

Wood Green.—Houses and flats, Devonshire Hill; borough engineer.

Yorkshire.—School, Cottingley Bridge, Bingley (£87,000), for West Riding C.C.; county architect, Wakefield. School, Eccleshill (£40,541), extensions to Thurcroft school (£10,300), and enlargement of infants' department, Doncaster Road school, Mexborough, for West Riding E.C.